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Foreword

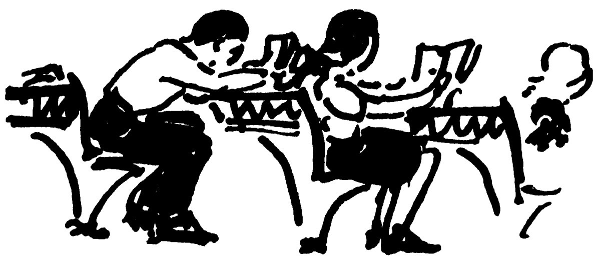
Those who would write a book should have an excuse, preferably a good one. Ours is that we are interested in better school plants. We have had different kinds of experience with school plants. We have seen many of them and we have some ideas about them. Of one thing we are sure: American communities need and deserve more and better school plants. Lots more and much better. We hope that those who read this book may have the urge to help America get them.

We recognize that a new school plant is the business of a lot of different people. It's the business of the people of the community. They own it, use it and pay for it. Their legal representatives, the school board, are charged with the job of building it, maintaining it and operating it. Their superintendent of schools and his staff actually live in it, guide and direct what goes on in it. It's the business, too, of the architects who design the plant and watch over its construction; of the engineers who translate their knowledge and research into practical structures and systems; of the contractors and their workmen who give reality to the dreams. It certainly is the business of the users—the boys and girls, men and women—of this and future generations whose lives will be shaped through their relations with it. Yes, it is the business of a lot of different people. It is to all of them we write, and to others, in the hope that somehow they will be stimulated to dream grander dreams and work richer plans; that somehow they will create school plants which will be living realities of the best American life. Plants which will embody the best of American idealism. Plants in which people can grow and be happy. In which communities can be born. School plants which demonstrate what can happen when free men work together toward common, worthy ends.

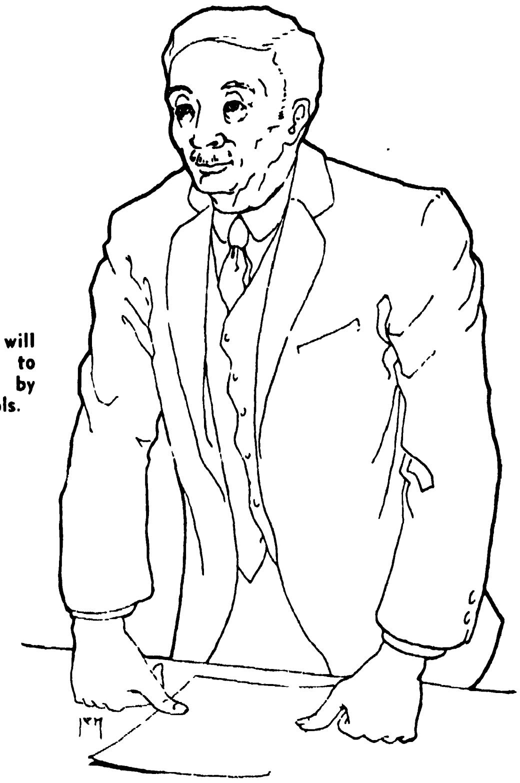
In the preparation of this book we have consciously and unconsciously called upon scores of people for help and assistance. All have been more than generous. They have contributed ideas, made criticisms, read manuscripts, suggested improvements, furnished illustrations, and given encouragement. It is quite impossible to single out individuals for special acknowledgments. To all who have helped in any way we shall be forever grateful. We must mention, however, Archibald B. Shaw, Assistant Superintendent of Schools at Scarsdale, New York, and Wayde Grinstead of Chicago for their contributions to the organization and writing of the manuscript. Also we bestow our accolade upon Charlotte Graf for her patience and fortitude during the months the manuscript was in process, and to Eleanor Licht and Eve Carvellas for their skill in making it legible for our publishers.

Finally and frankly, this is an attitude book: our attitude. What we write on these pages is what *we* believe. We have attempted to present more than mere facts and figures. We have done our best to describe what we believe a school plant could be like, and an approach which may bring it about. What we write will have value if it challenges others to re-evaluate their own concepts of a school and to propose better solutions and better ways of arriving at them.

PROLOGUE: The Meeting Will Come to Order



The pigtails of the girl who sat in front.



The meeting will please come to order. Sketch by John E. Nichols.

Let us attend, all-seeing and unseen, a meeting.

The meeting is called to discuss plans for a new school.

The people at the meeting are important citizens of the community. They have been chosen to stand, to think, to act for the community.

They represent various interests. They wield influence in varying degrees, upon the community and upon one another.

If questioned individually they would agree that it is their duty to do the Right Thing. But together they may have trouble agreeing over the nature of the Right Thing.

Sometimes what they say in meeting is not what they think, or believe. Some are keenly interested. Some are almost bored. Some by nature aggressively try to channel the current of the meeting by force of their wills, or whims. Others are seeking for facts and interpretations on which they may base judgments. They are all polite.

Let us hear what they say. But more important, let us tune in on their thoughts: the images, the remembrances, the hopes, the doubts, the turbulent eddies of their subjective approaches to the problem at hand.

There is an old one, an elder, a patriarch. He is chairman. He rises slowly, with the experienced and dignified deliberation of one who knows that by the time he has stood to his full height the subdued and neighborly chattering will have half subsided, and he will have to rap fewer times for order. He clears his throat and . . .

The Chairman: The meeting will please come to order. Well, I guess you all know why we're here. About every community in the country's facing the same problem we are here. It looks like we've got to have a new schoolhouse. And of course we want it to be a good one. But we've got to buy it. Nobody's going to give it to us. There aren't any minutes of the last meeting to read, because it's been a long, long time since we've built a school. But I'm going to ask Jim Halloran to read off some of the facts and figures about what we need and what it might cost—he ought to know, he's been chairman of the school board—and after that the meeting is open to you folks to say your say or to ask questions. Now I'm going to sit down. Go ahead, Jim.

As he lowers his weary frame the droning statistical phrases start, and the Old One, half lost in reverie, takes off on a misty trip back to the dusty road he once trod to the one-room schoolhouse on the hill. Those were the days. Barefoot in April, and the puffing dust underfoot a lilac-scented talc. Barefoot boy's gone a long ways. Those were the days.

The school bell—not the one in the little steeple—the hand-bell the teacher swung to end recess. The pigtails of the girl who sat in front, the proximity of the inkwell, the temptation, the foul deed, the ink-stained tresses, the giggles, the invitation to stay after school, the scarlet welts from teacher's beating, and the first acceptance as a regular guy.

Those were the days. That walk to school seemed a lot longer in winter. Put on itchy long underwear. Climb into layers of pants and coats. Muffler around the ears. Feet in clumsy overshoes. The trudge up the slippery white hill. The stinging whip of the wind in the resonant silence. Red, runny nose. Blue lips. Rattling teeth. And finally the cheery cherry flow of the pot-bellied stove in the corner. Those were the days.

Or were they? The stove was partial. The room was too hot or too cold. Sometimes the roof leaked. The seats were uncomfortable. Stone walls do not a prison make. And there was that time every kid in school got sick and they found out the well water was to blame. And that privy was mighty cold in winter.

Maybe those weren't the days. Wonder why I thought of that? Oh yes. That school we built here just before the first World War. Had a meeting just about like this. We thought that was some school in those days. It sure was a big one, biggest in the state. Everybody was mighty proud. Real marble pillars—genuine marble, all the way from Vermont. Nothing but the best for us. Cut stone inserts all over the outside walls. Some of the folks wanted to spend some of the money for more land for playgrounds, but we couldn't have had those marble pillars if we'd done that. Yes sir, that was a mighty pretty school in its day. There's some folks, though, who say there's a mighty big investment in that building for the little time it gets used—just five days a week for only about nine months the year. But they forget a school's not like a factory—you just have to have a big building, even if school kept only during the winter months, like when I was young. And there was a lot of complaint about the money it took to keep it going. Never could understand why we've had such a hard time keeping teachers lately, when that is still one of the biggest, finest schools around here. We thought when we built that school we were giving this community something to be proud of, and giving the kids about all the advantages in the world—a lot more advantages than any of us ever had. Plumbing, right in the schoolhouse. Drinking fountains in the halls. Fire escapes . . . . . Polite hands straggle a spurt of applause as Jim Halloran ends his recitation, and snap the Old One's reverie. An impressive, modishly dressed figure rises immediately to take up with words—as if by some strange mental telepathy — the thread of the Old One's thoughts. She is Mrs. Owen. She is important.

Mrs. Owen: (beaming imperiously) Mr. Chairman.

The Chairman: Yes, Mrs. Owen. You all know Mrs. Owen, I'm sure, and I'm sure her record of leadership here in town—especially in club work—

It sure was a big one, the biggest in the state.

The stove was partial.

Just think of all the glorious beauty of Greece and Rome and the Gothic period and the Renaissance and quaint old England.

I am not one to shirk from duty.

makes anything she has to say worth listening to. The floor's yours, Sarah.

Mrs. Owen: Thank you, Mr. Chairman. Ladies and gentlemen. You all know that I am not one to shirk from duty and I feel it my duty to speak first and speak now—to get in the first punch, if I may resort to slang—so that this beautiful little community will not make the same mistake other communities seem to be making. I mean that our new school should be an object of pride, a building of beauty and distinction, one like the grand old school we built when I was just a child before the first World War and which was the envy of every other community in the state and I am putting in this first punch, as it were, because there has come to my attention a trend toward a new and so-called modern kind of school architecture that just disregards all sorts of traditions and everything I think—and I know there are lots of solid citizens who agree with me that we owe it to our children why I was just saying the other night how horrid for anyone to think of building a school that has so much glass in it that it looks like a factory that's just what I said like a factory when there are so many beautiful and cultural things in life that can be commemorated in real beauty that will be remembered by our dear children and

We are not building a factory to produce machines—we are dealing with human souls.

We should proceed very conservatively to get our money's worth.

Mrs. Owen: (Continued) ladies and gentlemen we are not building a factory to produce machines—we are dealing with human souls whose hands hold the future of our country and they should remember their school as something to look up to and of all things our school buildings should pay a tribute to our forefathers who made this great free country . . .

As she continues the Old One, who has heard her speak many times, ranges his contemplative gaze over the group. There's B. F. Hawkins, doodling on a piece of paper in those precise banker figures, probably figuring what the bonds will bring. Sam Jones, over there, looks mighty interested in all this, but I guess he should, his brother being a contractor. Wonder if Ray Kelham looks so eager because he figures he might palm off that swampland of his for the site. Wup, Sarah is bringing in Thomas Jefferson so she must be just about through . . .

. . . and Thomas Jefferson who was not only one of the greatest architects of all time but the father of public education well you just look at one of his buildings and see . . . and that's the kind of thing we ought to have. Just think of all the glorious beauty of Greece and Rome and the Gothic period and the Renaissance and quaint old England and our own Colonial times that we can draw from and I say to you my friends we can afford it and it is our duty to do it and give our children and our community something of lasting beauty that will be a shrine to our great cultural heritage and something of lasting beauty that we can all be proud of. Why the beauty of the great cathedrals of Europe and the great classical homes and buildings many of which I have had the privilege of visiting when I was abroad why I tell you ladies and gentlemen and you'll pardon me if I relapse into slang again but there is beauty that is just out of this world and that is the kind of thing this community can afford and should have I thank you.

The Chairman: (After the applause has waned) Thank you, Sarah. You always put on a good speech.

B. F. Hawkins: Mr. Chairman.

The Chairman: Yes, B. F.

Mr. Hawkins: There's certainly a lot in what Mrs. Owen says. When we built our new bank

They don't need any architect to tell them how to build.

building back in 1928 we took into consideration that part of our stock in trade, as it were, is the prestige we command in this community. If you're going to be important you've got to look important. A part of our stock in trade is people's belief in our stability. That may sound stuffy to some of you but it is so. That is, within reason of course. And that's why we decided, along with our architects, on the copy of an old Grecian temple which you are all so familiar with, and I think you'll all agree it's a pretty impressive structure. But I was just thinking about another angle that has to be considered, and that's the angle of cost. As you all know, costs have gone up, especially the cost of building, building anything, and particularly something fancy. And I'm just thinking out loud now, but I wonder if we all shouldn't give real careful consideration to the problem of cost when we figure on building a school that is just to be used for a school, that is a building that you might say serves only a part of the community even though our children might be regarded as perhaps the most important part. We all know good schools bring good people and are good business. I agree that we should have a beautiful and impressive school, but taxes being what they are and costs and everything we don't want to scare good solid citizens away with high taxes. We should proceed very conservatively to get our money's worth. That's just my opinion.

Sam Jones: Mr. Chairman.

The Chairman: Mr. Jones.

Mr. Jones: That cost angle is certainly important, and I'd just like to suggest that one way to keep costs down and still build a handsome building is to cut out a lot of expenses. In my opinion we should by all means let the contract to a capable construction firm right here in town. I'm not one to say which one, but you can find out if this builder I'm thinking of won't be able to save you a lot of money. A com-

Mr. Jones: (Continued) pany that's built some pretty big important buildings around here can cut a lot of cost by saving on—oh, architect's charges, maybe—everyone knows you can call on some people with experience and they don't need any architect to tell them how to build—and you'd be surprised how much money you can waste on architect's fees and suchlike. But I guess I don't need to tell—well, anyway, I think we certainly ought to look into costs.

The Chairman: (While Mr. Jones is talking, the Old One notes with some surprise two young fellows about high school age who seem to be bursting with something, but trying all the while to give the impression of grave attention to all that goes on. He turns to the superintendent and says a word, listens a little skeptically to the hurried low remarks, ponders, then turns with an air of decision as Mr. Jones reaches his last clause and sits down in noble and conscious rectitude.) Thank you, Sam. Now I'm going to ask you folks to bear with something a little unusual. There's a couple of our younger citizens here, and you know and I know that while they really don't have any right here, I'm going to make an exception and right now let them say what, if anything, they've got on their chests. They're old enough for our country to need them for training in the armed services, and they're old enough to get a chance to say their two cents' worth. Now, Bill and young Brown, what's on your minds?

Bill: Well, Mr. Chairman, thanks a lot for calling on us. We know we're not old enough to vote—or pay taxes—but some of us fellows are going to be paying for the new school for a long time and we did some thinking. Well, I mean I wasn't even born yet when our school was built, and it's going to be a long time before I have any children ready to go there—so it'll be an old building before I get anything out of it, the way our school is. But next year I'll be out of school — and I'm lucky enough to have a good job to go right into—but even so, some of us who're not going off to college won't have anywhere to go—I mean all those good times in basketball and the gang and all—well, they won't be open for us any longer. Well, anyway the fellows feel we ought to have a gym and maybe an electrical shop or something that would be open to us younger fellows for hobbies and fun when the younger kids aren't using it.

Mr. Kilroy: Mr. Chairman! Sir!

Chairman: Just a minute, son. Thank you, Bill. I expect we're all glad to hear that some of our young'uns are looking forward to staying home here with us. And I'm proud of the older folks who are willing to give you a chance to be heard. Now the way Mr. Shaw is looking at his watch reminds me that you, fellow, may want to be excused to get your studying done. Thanks again for coming and joining in with us. (Turning to Mr. Kilroy with the remnants of the indulgent smile.) Now, sir, I'm sorry I don't know your name, but my old eyes can sure make out that purple bar in your buttonhole. You've certainly earned the floor. Go ahead.

Mr. Kilroy: I'm glad Bill spoke up. He's just beginning to see the kinds of problems young fellows have. It's more than basketball. Sure, there are

Some of us fellows are going to be paying for the new school for a long time.

A place somehow that Marge and I and lots of the others can go to learn and yes, to play.

lots of people who tell us that we've got our G.I. Bill of Rights and all that, but me and my family, we have a good job, and we like this place, and we want our kids to have good schooling—a better school than we have home, by the way. But don't get me started on housing. I just wanted to say that some of us have tried this correspondence course racket and with trying to study in a house that's bulging already—well, anyway, we think there ought to be a chance not just for gym stuff, but to get into the shops at the school—or maybe work on real courses so we can get ahead. We don't want a college—don't get me wrong. But these beer joints now are nearly the only place we can get together and fan the breeze, and we've seen places where they give young couples a chance to work and study at what they want to learn. If you're talking about a school I certainly hope you are thinking about making a place somehow that Marge and I and lots of the others over in my section can go to learn and yes, to play in the gym, and even maybe to dance in. I didn't expect to say anything tonight being pretty much of a stranger here still, but thanks for listening anyway.

Chairman: Thank you, soldier. (As the Old One is about to make further comment a stocky, swarthy, middle-aged man stands quickly for recognition. He is Joe Vocek. He is well-known, for he is the voice of labor in the community.) Yes, Joe.

Vocek: Thank you, Mr. Chairman. It's good to hear these young fellows after all that talk about costs and architecture, etc. I realize this is only a preliminary discussion, but when this thing gets into the final planning stage it seems to me the most important thing to consider is the people—people like Kilroy and young Bill, like my kids and yours, and grown-ups too. Mr. Kilroy is like a lot of the folks I represent — who'd like a place where they could meet evenings. A place where they could read, and study, and putter around with their hobbies. Another thing that should be considered — this new

This new school should be more than just a schoolhouse.

Old traditional architecture is truly out of this world. It belongs to another world, one we left far behind.

Mr. Vocek: (Continued) school should by all means provide plenty of health facilities and health personnel. And I'd like for everybody to think this over—a lot of our children don't have proper places to play. This new school should be more than just a schoolhouse — it should provide room and equipment for good recreation for everybody, the year 'round.

Mrs. Owen: Pardon me, Mr. Chairman, for interrupting, but Mr. Vocek, I trust you realize that those extra things—as it were—cost a great deal of money.

Mr. Vocek: I certainly do, Mrs. Owen. Did you ever think how much more it costs *not* to have them?

Mrs. Owen: And I would like to point out to Mr. Vocek that one of the reasons for the tremendous rise in building costs is the ever-increasing cost of labor.

Mr. Vocek: Yes, wages are higher, Mrs. Owen. So are automobiles and beefsteaks and shoes. And I would like to remind Mrs. Owen something about those cathedrals that are so beautiful. They *are* beautiful. I know. I come from the Old Country. But those beautiful cathedrals were built by the back-breaking toil of thousands of men who were just one crust of bread away from starvation. Would you trade?

B. F. Hawkins: May I interrupt here, Mr. Chairman? I think I speak for Mrs. Owen—and, actually, for all of us who are gathered here—No, Joe, we wouldn't trade. Of course not. There is one thing to think about — whatever we do, whatever kind of school we build, will cost money. It will cost more money than our grandfathers would have dreamed of spending. It will cost some of us more than it will cost others. Taxes are that way. The money it will cost can be spent wisely, or foolishly. That is what we want to consider. Let's watch our step. There's no such thing as a free ride. I'm all in favor of putting out lots of money—lots of it—if we get value received. I want my grandchildren to enjoy as good an education as they can get. And I'm willing to pay. I know Joe Vocek feels the same way. But let's be sure — dead sure — we get our money's worth. Actually, it's a question that's way above money. It's a question that involves our making decisions here, this year, that will affect hundreds of lives in later years, for better or for worse. So, let's get together all the facts we need and study them seriously and conscientiously, without any political or economic bias. If

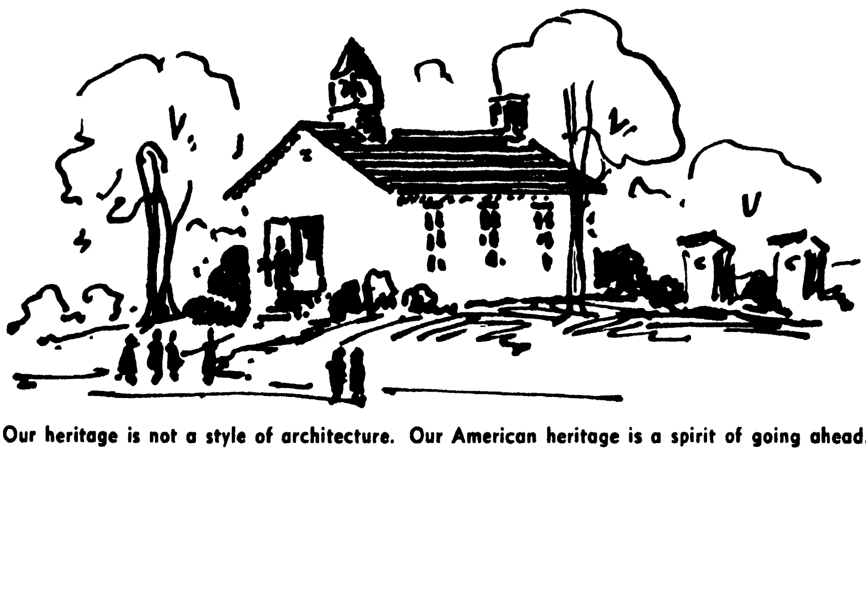
we can do that, we'll be making the best possible investment in our kids and our community.

The Chairman: Let's not turn this into a forum on economics, folks. We're starting in to plan for a new school. There's a man here who has devoted more time than any of us to thinking about this project. It's closer to him than to anyone else. If there's no objection, I'd like to hear a few remarks from our school superintendent, Mr. Robert Shaw.

Mr. Shaw: Thank you, Mr. Chairman. Let's wait awhile for me. Let's hear from an architect. There's been a lot said about the subject he's an expert in, and maybe he could clear up a few questions. He has specialized in the planning of schools, and I'd like to introduce him now. Mr. Glen Collins, of the firm of Collins, Fleming, and Smith.

Mr. Chairman: Mr. Collins.

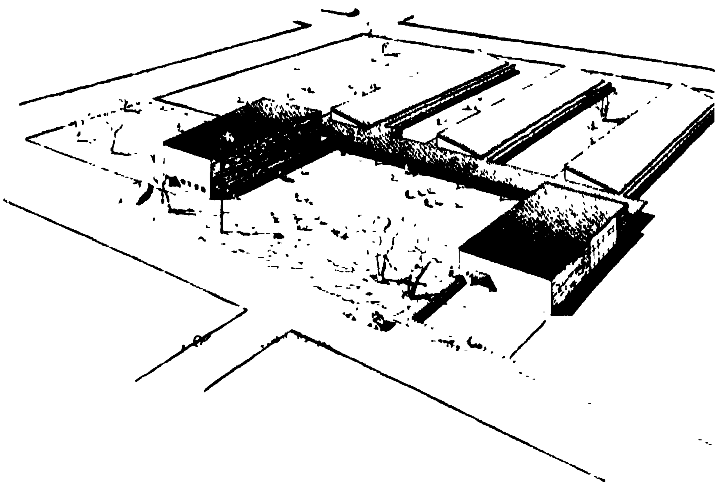
Mr. Collins: It's a privilege for me to be here and sit in on this preliminary meeting. I'm just as aware as any of you that anything I might say may be construed as special pleading. I have an ax to grind. Let's hope it's a good ax. The first thing I'd like to say is that no matter what kind of school is decided upon, it will start growing obsolete as the blueprints are being drawn. That's how fast we're moving in this world. So it seems like just good common sense *not* to start out with a building that was obsolete years ago. Now there's been a lot of criticism about so-called modern architecture. Some buildings that have borne that label have been, I'll admit, pretty horrible. But they were products of stylism, not thinking. Without trying to give a sermon on architecture, I'd like to point out that the famous architectural schools of the past — Greek, Romanesque, Gothic, Classical, and so on —most of them were actually modern in their day. And in their way they produced some beautiful buildings. I believe it has been remarked that their beauty was out of this world. That is a very apt phrase. That old traditional architecture is truly out of this world. It belongs to another world, one we have left far behind. If you want Grecian architecture, do you also want your children to be accompanied to school by a sandaled slave? It would be in



Our heritage is not a style of architecture. Our American heritage is a spirit of going ahead.

Mr. Collins: (Continued)

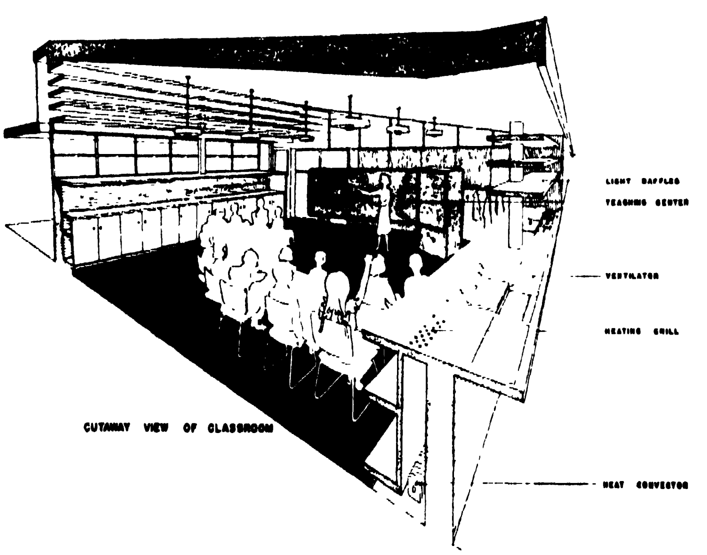
keeping. The great medieval cathedrals, which have been mentioned, have stirred the imaginations of men for centuries. Their decorations were lavish. But those decorations — the friezes, the stained windows, the gargoyles, the miscellaneous statuaries — they were the picture stories for the masses who could not read. They were the simple symbols that were rich with meaning for devout peasants. They even formed a major part of the ordinary man's education, illustrating the stories he had heard from his village priest. Do we want those now, just because they were important to a bygone age? Apparently some people do. Just the other day I heard of a suggestion for an English room in a high school —a brilliant idea that the room be constructed as such a room would be built in Elizabethan days — rough-hewed massive wooden beams . . . diamond-shaped panes of colored glass . . . crude benches . . . incandescent lamps shaped as candles along the walls . . . and, I suppose, a big print of Shakespeare looking down on the dimly lit room. Now I suppose the theory would be that the student would absorb English from such an atmosphere by osmosis . . . that spending his class time in such a room would imbue him with the spirit of those great characters who wrote so well and so fluently. I submit that the odds are against it. The student, if the room were constructed honestly by Elizabethan standards, would more likely absorb bad eyesight and a series of colds. That is just an example of a certain school of thought. What is English anyway? For some stu-

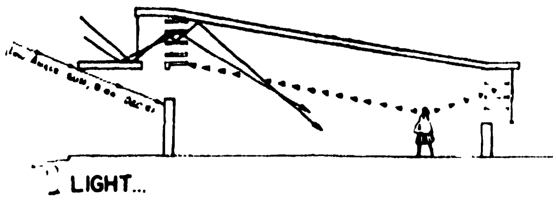


An example of grouping the main school elements around a large paved play area. The area is protected from the cold, north winds by the dining-playroom as shown in the lower right corner and also sheltered from the hot, summer suns by a playshed which separates the paved area from the classrooms. The three classroom wings are shown with a sloping roof. The large mass on the left is the auditorium.

Illustrations on this and facing page are of the proposed elementary school, Stillwater, Oklahoma. Philip A. Wilber architect; William W. Caudill, John M. Rowlett, Wallie E. Scott, Jr, associates.

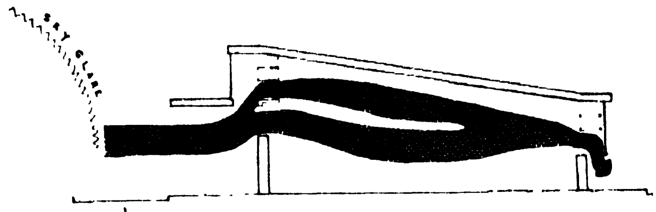
A cutaway section of the classroom. It illustrates how light, sound and air can be integrated into the classroom design.





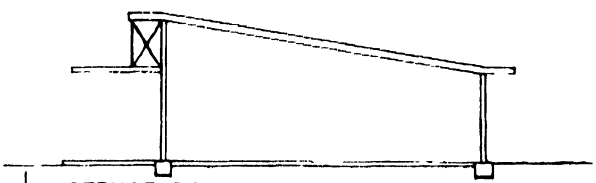
LIGHT...

- NO DIRECT SUNRAYS THEREFORE NO COST AND MAINTENANCE OF SHADES BETTER LIGHT NO MANUAL CONTROL
- LIGHT BAFFLES REFLECT LIGHT TO CEILING THUS BETTER LIGHT
- LIGHT BAFFLES PREVENT SKY GLARE.



AIR

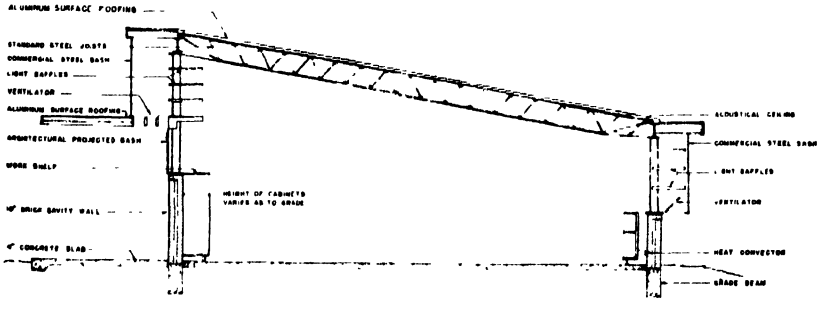
- OPENINGS ON BOTH SIDES FACILITATE CROSS VENTILATION
- INEXPENSIVE FIXED GLASS CAN BE USED
- WINDOWS CAN BE LEFT OPEN DURING RAIN
- AIR DIRECTED TO ALL PORTIONS OF ROOM
- PROTECTED FROM NORTH WINDS.



STRUCTURE

- SIMPLE STEEL FRAME SYSTEM
- NO COLUMNS OR COLUMN FOOTING FOR COVERED PASSAGE
- SMALLER ROOF OVERHANG

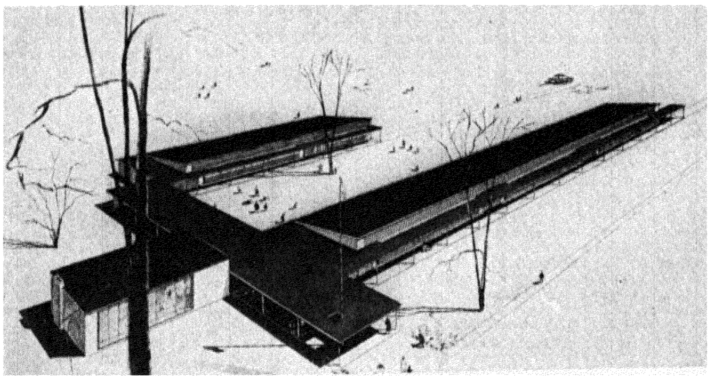
An example of a scientifically designed classroom for light, air, sound and the pocketbook This cross section is a further development of the one used for the Blackwell School. Cost were cut by eliminating the pipe columns of the exterior corridor and by replacing the outside metal louvers with low cost light baffles



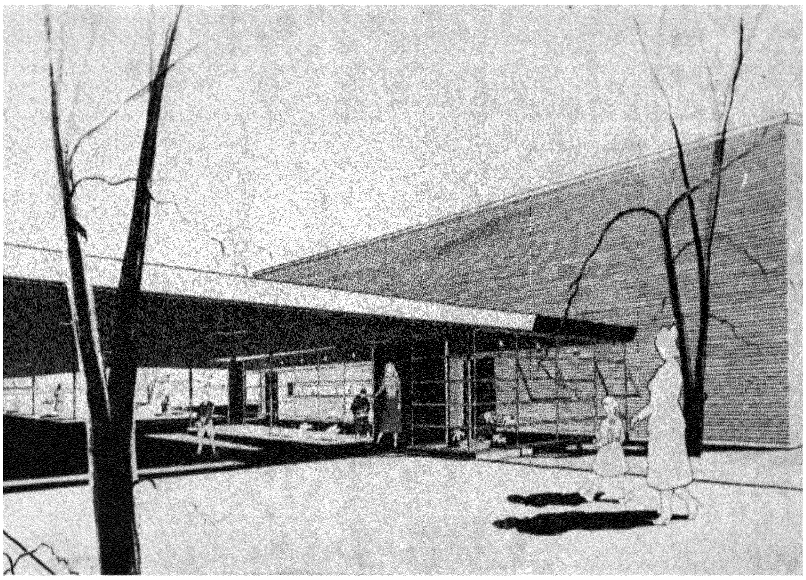
dents the study of English is an end in itself, and a very valuable one. They may end up as teachers or writers, and English then would be their profession. But those are few. For the great majority, English is a useful tool. And like any other subject it can be taught and studied and learned better under conditions of light and freedom and ease — in an *efficient* classroom. Now the so-called Colonial and Early American styles seem to be quite popular. And they have produced some handsome examples of simplicity indeed. But school today is not a charade in which our children perform decked out in powdered wigs. School is preparation of the child for the future, plus service to the whole community today. Is that a refutation of our heritage? I say no. I say our heritage is not a style of architecture, or several styles of architecture. Our American heritage is a spirit—a spirit of going ahead, exploring, braving the future with the best possible tools at hand, and inventing new tools as fast as possible to do a better job. The other day I attended such a meeting as this in New England. One of the influential members of the group insisted on a school built on the style familiarly known as Cape Cod. Why? Because that was the priceless heritage of this community, she said. It happens that she is out of touch with her community. It was once a whaling town, populated almost exclusively by Anglo-Saxons, who developed the simple Cape Cod architecture as a sturdy improvement on the buildings they had known in the British Isles. They used the best materials and techniques at hand, and

Mr. Collins:
(Continued)

used them well. But how about her community's heritage? That formerly Anglo-Saxon community is now a mill town. Its population is a rich mixture of French-Canadian, Italian, Jewish, German, Polish, Hungarian, Greek, Jugo-Slav, Rumanian, Oriental, Scandinavian —in other words, a typical industrial city. If we were to pay tribute to its heritage with sticks and stones, the building would be interesting, to say the least. Perhaps a Gothic shell with impressive flying buttresses —that would take care of French, German and Italian. At one end a minaret, for the Eastern European peoples, and at the other end, as a concession to the whalers and part-time pirates who settled the community, a trim little steeple, containing some quaint Chinese temple bells. Some of the Gothic windows would be mere slits, because that's what they had in the old days. They served as good protection from the archers. Other windows would be flanked by those green Cape Cod shutters that don't shut. The absurdity could be carried on at length. But such a conglomeration is no more absurd than some of the school buildings which have been constructed in our time. But we have not yet mentioned the most important part of the school. We have been speaking only of externals. That is only natural because architecture is too often thought of as merely a craft, or art, of exterior decoration. The important part of the school is what the child is given to grow with—yes, grow with —the space, the equipment, the surroundings of light and heat and ventilation. Yes . . . the essence of the good school is not its form



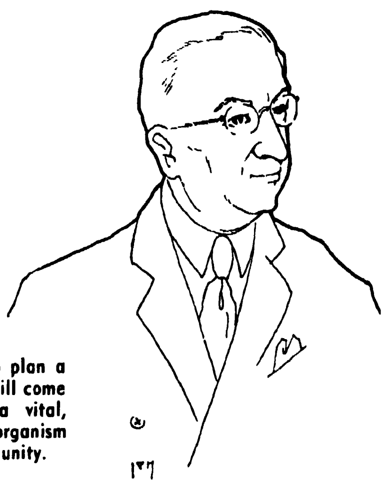
At left: the center mass of the Huston Elementary School, Blackwell, Okla. is a large play shed. It has a two-fold purpose: as a circulating area between the all-purpose room on the left and the two classroom wing on the right, and as a sheltered area for outdoor play, outdoor games, and outdoor assembly. The play shed has been designed for public use at night, for socials, for skating parties and open forums. There is a solid wall on the north which cuts off the cold winds. Below: main entrance of the Washington Elementary School, Blackwell, Okla. The play shed extends 150'. It is 32' wide. The auditorium has been designed to facilitate audio-visual programs. Accordingly, it is windowless, and the walls and ceilings are tapered for acoustical purposes. The lobby is primarily a glass show case. Both of these schools have the basic features of the Stillwater, Okla. School which is on pages 12 and 13. William W. Caudill, John M. Rowlett architects; Wallie E. Scott, Jr., Philip A Wilber, R E. Means, Associates.



but its function. I hope you will remember that in planning your school. (He sits down, wishing he had kept his big mouth shut.)

The Chairman: Thank you, Mr. Collins. And now, Robert?

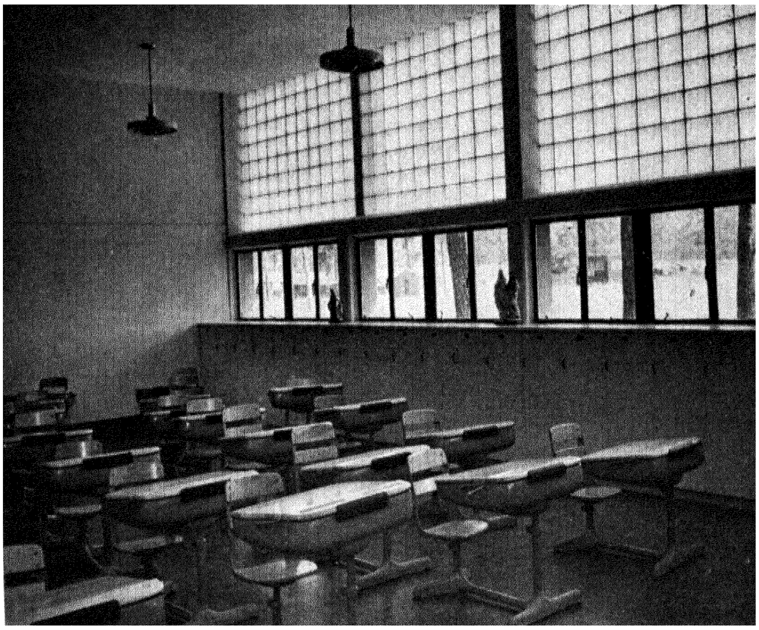
Mr. Shaw: There's a lot of planning to do . . . a lot of planning. I hope all of us appreciate how important this new school can be and should be to the entire community. Everyone will be called on to help. And in our future planning let us think of tomorrow. For this school is to be built for tomorrow, whether badly or well. Let us try to plan a school that will come to life as a vital, functioning organism of the community: this one, individual community; a plan that will satisfy the needs that are peculiar to this one community. We will not be ordering this school out of a mail-order catalog. We will not be buying it from a rack. It is true that such and such a city may have a nice school that is just about the size we need. It may almost fit. But it won't fit. The school we build must be tailor-made to our own requirements, made to fit the real needs of our community—the real needs, not just the school children's needs — our needs, not those of any other community—and planned to accommodate our own future needs. I have mentioned cost, and that the new school will cost a lot. We are a reasonably well-to-do community, but there is no reason for us to be extravagant. To paraphrase Mr. Somerset Maugham, we do not need to gorge ourselves on caviar when we are not hungry, just because it is expensive. What we must do is plan. And the plan we make must be a part of the entire community plan. In



Let us try to plan a school that will come to life as a vital, functioning organism of the community.

Mr. Shaw: (Continued)

framing that plan every member of the community can take part. The P.T.A. can help immensely, and I am sure they will. The Boy Scouts can be used extensively for compiling a house-to-house, block-by-block school census. We can get valuable information from Mr. Hawkins' bank, and from the public utilities, and from many other commercial and industrial interests in our community. The women's clubs and the men's luncheon clubs can be depended on to work with us in forming this plan. But it's not my job to say who will help plan. I am only suggesting, inviting. Some jobs we know already can best be done by certain groups like those I have mentioned. But as we — you and you and we — go on planning, we will find more and more who are willing to help and more and more whose help we need. This is the community's job and needs the best brains, the best talent, the most loyal work from each and every member of the community. It is inevitable that during this planning stage, there will be private interests which will conflict. The choice of a site—and there are several which will be under consideration — may favor some members of this community and not others. Throughout the project there will most likely be conflicts of ideas and interests. I am sure we can work together and iron out whatever differences may arise from time to time. It all depends on the attitude we take, each of us singly, and all of us as a community. That attitude should be that this is a community project—not the expression of one individual or one group. So let us

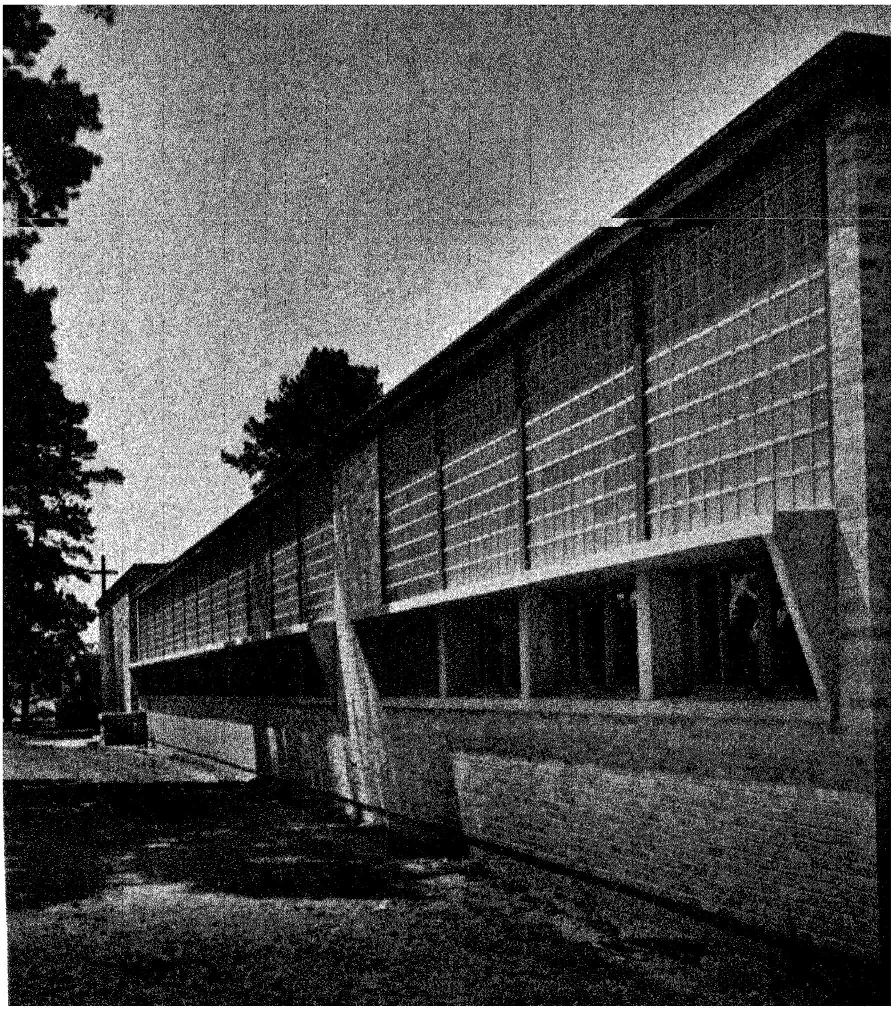


Arc-lined seating and wall of light. Golemon and Rolfe architects, Dorell Boyd Harmon consultant. Courtesy *Progressive Architecture.*

Mr. Shaw: (Continued)

work together for a plan that will give the children of this community space, and light, and health for the development not only of their minds but of their personalities; a plan that will give the adults of this community—as Mr. Vocek has suggested — a center for their social activities; a plan that will become a centripetal force binding the community more closely together; a plan that will be flexible to adapt to changes in curriculum still over the horizon, and expansible, to be able to accommodate children and programs yet unborn. It will cost. Yes . . . it will cost. But this community spends more for the comforts of light and fuel and water and telephones in its homes than it does for the education of its children . . . more for cigarettes and liquor and cosmetics than for its children's schooling. Now I have an abiding faith in the triumph of common sense. I have faith that this community will realize the growing needs of its growing children and will move to meet those needs. I have faith that the result will be a functional plant for education and community service, rather than another little red schoolhouse, or the individual cathedral our architect friend mentioned. The times are changing, and they are changing fast. The trend in education—and the trend in educational buildings—is toward common sense and progress, and away from the chaos of the past. Working together we can build this community a building that we can all be happy in and proud of, happy because it will serve our needs and help make our own lives richer, proud because it will ac-

Glass block and casement windows in school at Houston, Tex. Golemon and Rolfe, architects; Darell Boyd Harmon, consultant Courtesy *Progressive Architecture*



Mr. Shaw: (Continued) tively contribute to the growth of our children and our pride in them now, and as citizens-to-be.

Well, what will that new school be like?

Will it be a center of light, beauty, convenience, service, growth; a place to love and use; a functioning organism?

Will it be a stunted compromise, shrunk by a fear of the lack of money?

Will it be an opulent display, an edifice of dubious and borrowed dignity, a structural thing of sound and fury, signifying nothing?

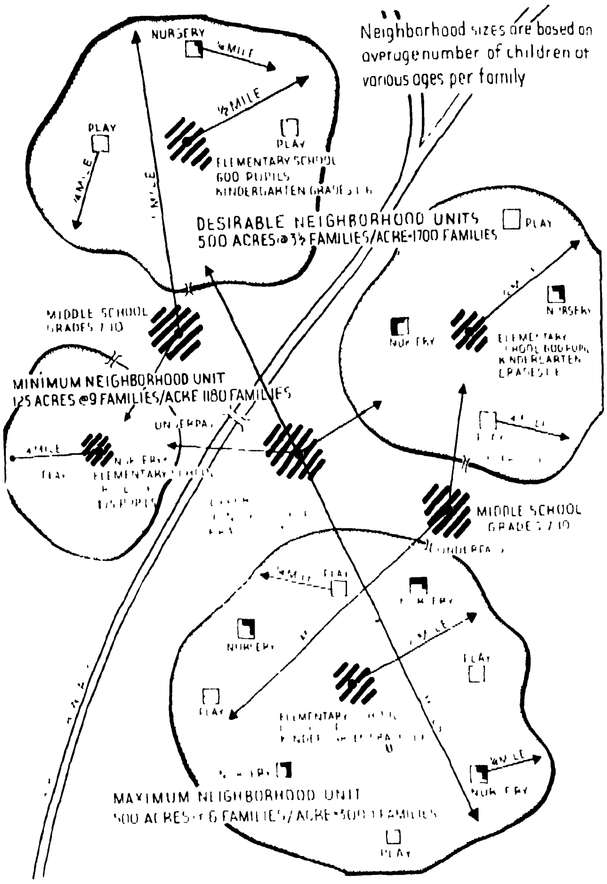
It is easy to compromise with the future when dollars are involved. The statistics come later, but everyone knows that school costs are going up. Well, there has never been such a thing as an inexpensive school. The very idea of free public education is fairly recent. And when Thomas Jefferson and others espoused it many were shocked, for the very cost of sending everybody to school would bankrupt the community. Only those who could afford to pay deserved to learn—that was the theory.

But there were people in the young republic who had fought for freedom because they impudently believed they could govern themselves. They also fought for public education because they impudently believed their children deserved a chance to learn. They dared to be forward-goers. They blazed away at Indians and wildernesses and old worn-out ideas. They won a lot of territory, and not all of it was geographical. For they blazed away at ignorance, too.

There were those who screamed about high costs in the days of log-cabin schools. There were those who thought only of costs when the prim and neatly-painted red schoolhouse was built on the hill by the dusty road. Like the poor, except in their esteem for thrift, they will always be with us. No flat statistical table or chart can adequately illustrate the growing need for new schools. Of course, there are more children to educate. The child of today and the child of 1900 are equal, statistically. Each is one. If only numerical growth were to be considered, then providing adequate schools might be merely a matter of providing enough additional one-room schoolhouses, like providing extra shelf space for extra packages.

But the people who have fought for progress in education have refused to regard the child as a number one. They have refused to concede that a child's learning must stop at being able to read the Daily Blat, write for a necktie that glows in the dark, and figure batting averages. They have even learned that schooling is more than just child business. Adults need and want it, too. They have also refused to sit back complacently and bask in our American brilliance. That flash over Hiroshima signaled brilliant achievements by brilliant minds; but its very brilliance made startingly clear the deep dark shadow of the ignorance of all of us who cannot comprehend. That flash, incidentally, made it clear that the people, the moiling millions, had better learn more than ever before, or else.

CHAPTER 1: The Site



Elementary schools are neighborhood centers, while schools for older children tie the neighborhoods into a community

To paraphrase an old saw about human greatness—some communities are born with school sites, others acquire sites, while still others have sites thrust upon them.

The site upon which the school is located, or for which it is planned, throws a series of staggering challenges at school and community administrators and planners.

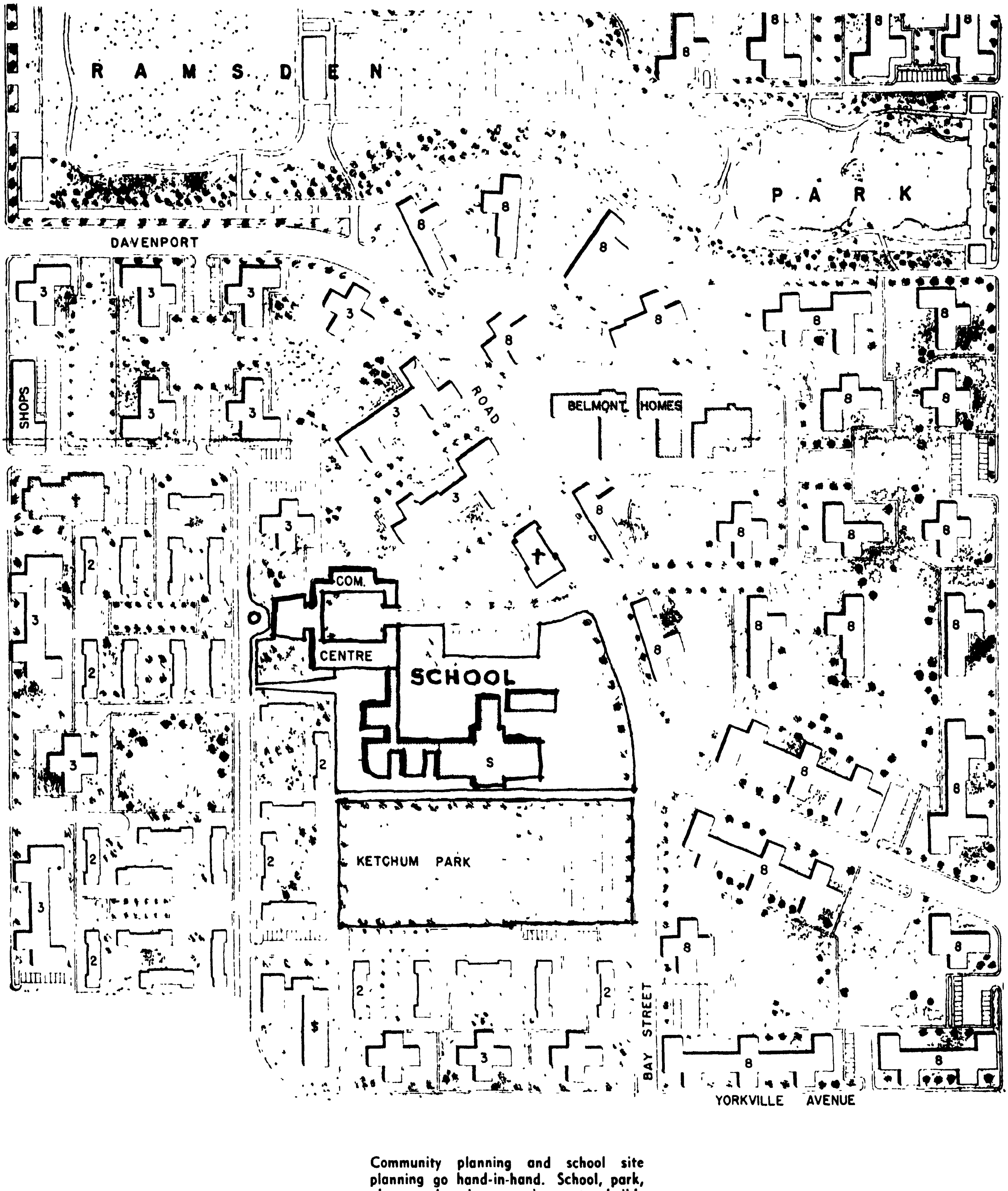
It is obvious that for sheer convenience the school should be located within a residential community, close enough to be easily accessible to the pupils—and homes—it is to serve.

Certain standards of accessibility have been laid down by some pretty thoughtful planners. They would locate elementary schools within three-quarters of a mile of the farthest home in the neighborhood to be served; intermediate schools would serve homes as far away as a mile-and-a-half; while high schools would serve a maximum radius of three miles. These standards, of course, are applicable chiefly to thickly populated areas; they obviously would not apply in many areas of school administration, such as those where school bus systems shrink travel distances. Again, each community can best work out its problems by amassing all the available information about its own individual needs.

And accessibility, important as it is, remains only one of the many factors involved in the selection and adaptation of the school site.

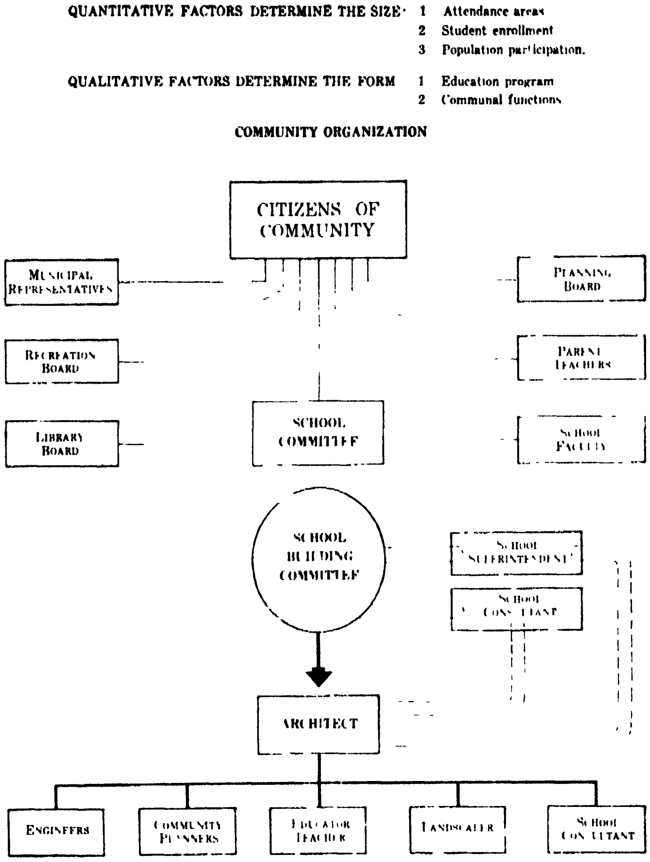
It is well enough to say "Let's plop that new school right down here because it's in the middle of the neighborhood." And that might work out ideally for today, and next year, and the next ten years.

But school sites can be more vulnerable to obsolescence than the school buildings themselves. Not obsolescence in shape or form, for the good earth and the geography are hard to alter. The danger of obsolescence comes from lack of planning, lack of foresight, a failure even to use a dime-store crystal ball in estimating what the community-site relationship will become in the future.



Community planning and school site planning go hand-in-hand. School, park, playground and community center building are the heart of the neighborhood. Courtesy *The American School and University.*

This chart of the planning process was prepared by Charles Burchard, Department of Architecture, Harvard University, under the guidance of Walter Gropius, Professor of Architecture.



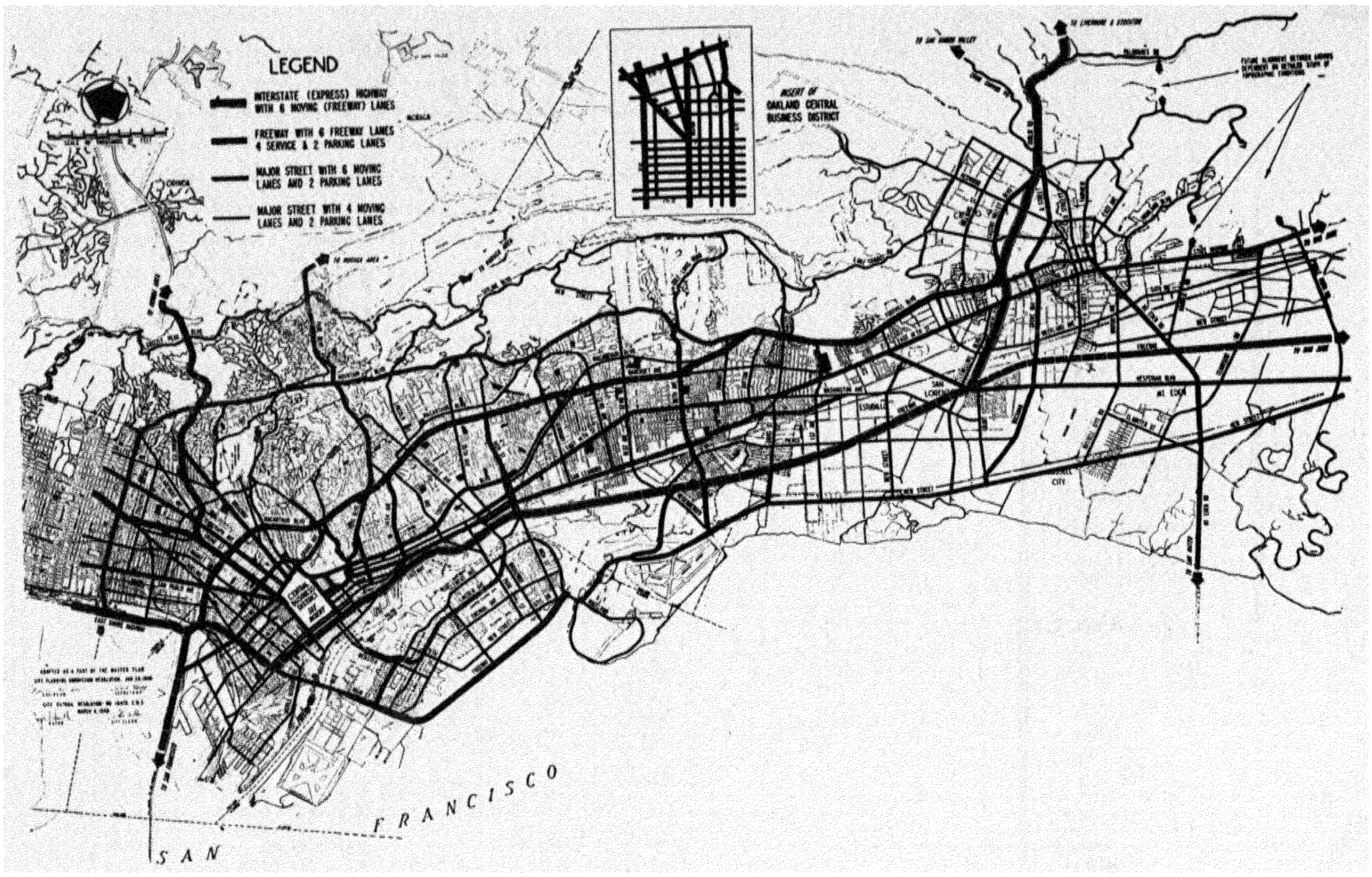
Thousands of cities and millions of families know to their sorrow how the reckless and unplanned real estate foraging of industry has brought blight to once quiet residential areas. The school building itself, quite often, has remained adequate and physically unhurt. But the residents can move. The site cannot. As a functioning part of the community school system it becomes obsolete. It may still work, but it does its work badly.

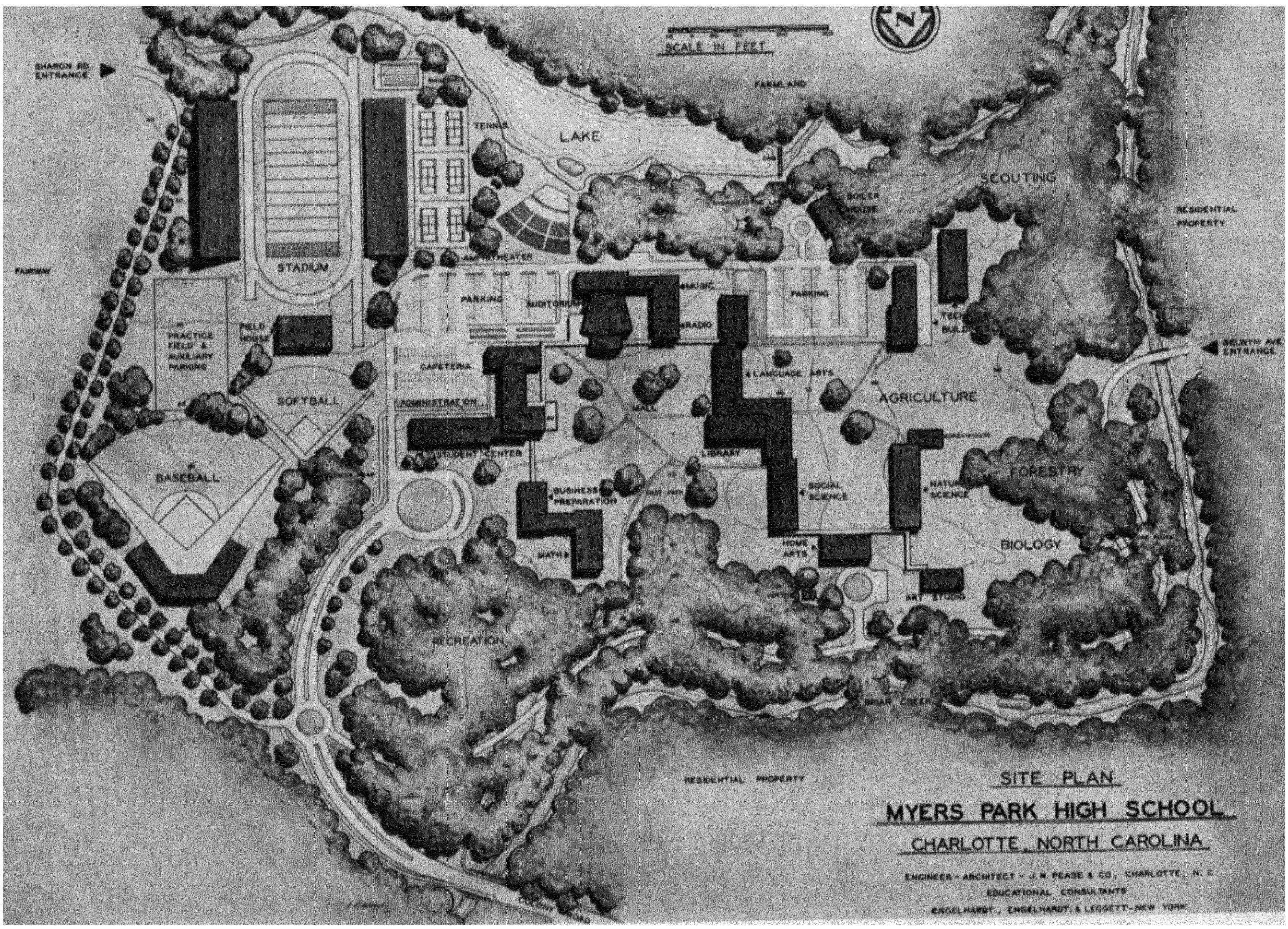
Fortunately, more and more communities are realizing that America's heroic industry does not have to play a villain's role; all it needs is a new script. In other words, co-operative planning. Planning for the community as a whole. Planning based on information, carefully analyzed, wisely interpreted. Planning which puts an end to hurly-burly mismating of smokestack and family fireside. Where communities have said, "Here, industry, you locate here and you grow in that direction," industry has usually prospered even better than when it sprawled haphazardly. The same goes for stores and other commercial establishments. And this foresighted planning has enabled communities to place their schools and parks and playgrounds where they should be—where the people who use them live, and will continue to live.

This may sound like an endorsement of wise and organized city and community planning. It is. It cannot help but be. The planning commission is and should be the logical agency to design the future for the community, and the school board should take an important part. In actual fact, in many a city it is the school board which strikes the spark that produces action. The results are seen not only in improvement, but in beauty and orderliness and efficiency. They are seen in the characters and personalities of the growing product of the schools.

Thoughtful planning implemented by zoning provides the right locations for schools both in those neighborhoods whose population is stabilized and in those which are growing.

And what is the basic unit on which community planning rests, from which it evolves? The neighborhood. It is the unit generally agreed upon by planners in this country and abroad. And what is the one determining factor, the nucleus, of the neighborhood? The elementary school. Clarence Arthur Perry of the Russell Sage Foundation and the Regional Planning Association of New York puts it this way: "A residential unit development should provide housing for that population for which one elementary school is ordinarily


LEGEND
INTERSTATE (EXPRESS) HIGHWAY WITH 6 MOVING (FREEWAY) LANES
FREEWAY WITH 6 FREEWAY LANES 4 SERVICE & 2 PARKING LANES
MAJOR STREET WITH 6 MOVING LANES AND 2 PARKING LANES
MAJOR STREET WITH 4 MOVING LANES AND 2 PARKING LANES
INSERT OF OAKLAND CENTRAL BUSINESS DISTRICT
SAN FRANCISCO


SCALE IN FEET
SHARON RD. ENTRANCE
FARMLAND
LAKE
TENNIS
STADIUM
AMPHITHEATER
SCOUTING
BOILER HOUSE
RESIDENTIAL PROPERTY
FAIRWAY
PARKING
AUDITORIUM
MUSIC
RADIO
PARKING
TECH. BLDG.
SELWYN AVE. ENTRANCE
PRACTICE FIELD & AUXILIARY PARKING
FIELD HOUSE
CAFETERIA
LANGUAGE ARTS
AGRICULTURE
SOFTBALL
ADMINISTRATION
MALL
STUDENT CENTER
LIBRARY
FORESTRY
BASEBALL
BUSINESS PREPARATION
SOCIAL SCIENCE
NATURAL SCIENCE
BIOLOGY
MATH
HOME ARTS
ART STUDIO
RECREATION
BRIAR CREEK
RESIDENTIAL PROPERTY
SITE PLAN
MYERS PARK HIGH SCHOOL
CHARLOTTE, NORTH CAROLINA
ENGINEER - ARCHITECT - J. N. PEASE & CO., CHARLOTTE, N. C.
EDUCATIONAL CONSULTANTS
ENGELHARDT, ENGELHARDT, & LEGGETT - NEW YORK

Street and highway planning affects neighborhoods—and hence school planning. Harold Bartholomew and associates city planners. Courtesy *The American School and University.*

Is 70 acres too big? It is just right for this school's activities. Courtesy *The American School and University.*

required, its actual size depending upon its population density."

But merely defining the physical and numerical size of a neighborhood is not enough. There must be taken into consideration the activities of the people of that neighborhood. Ideally, the neighborhood unit should be bounded by arterial streets. Let the rush of business traffic and cross-city joyriding speed on by. But not through. On these loaded trafficways, on the rim of the neighborhood, can be located the stores and shops and other commercial enterprises—perhaps even adjoining similar commercial establishments of adjacent neighborhoods. But the neighborhood's own street system should be designed to discourage, rather than attract, through traffic.

The school should be located centrally in this protected area, and it is logical that such a location is ideal for parks and playfields, too.

Sometimes suitable school site land is not available at the center of the neighborhood. Far better, then, to locate away from that center than to cramp the school into an inadequate space. Too often the educational point of view is badly slighted. Size and character of site are not determined properly by recreation needs alone—either school or neighborhood—but primarily by the type of educational program *first,* with proper adjustment for community needs. The site differs not a whit in this respect from the whole educational plant. It must be big enough to allow and encourage expansion of the school's vital role in the community.

How big? The question itself is big. It is easy to say that the size of the site should be determined by the nature and scope of the educational program. Easier still to show how the nature and scope of the educational program and the neighborhood recreational program actually are being determined by the size of a particular site. There are "standards" available for the lazy or conscienceless here, too. As rules of thumb they are good, as yardsticks poor. Taken with a grain of intelligence, used as rough guides, they are useful. They may help stir the unimaginative, may reveal possibilities. But the accurate scale can be constructed only by laborious and keen gathering of facts, realization of needs—in the individual community.

Fifty years ago, the size of the site was not important. The educational value of play was assayed for little. Stars were studied from charts; plants from pictures; conservation from textbooks. The site was high enough, its area large enough to set off the

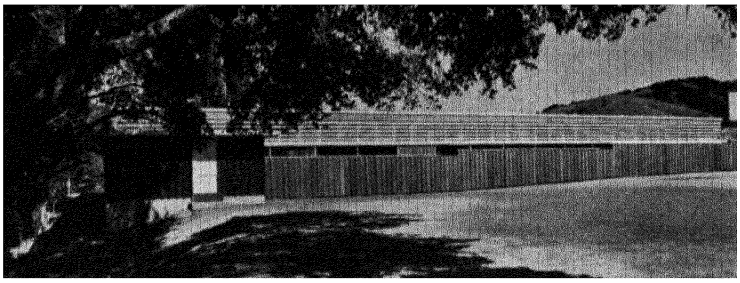
impressive monument which served as a school. Play space, what there was of it, is estimated to have been about ten to twenty square feet per child—a figure now inadequate for classroom area itself.

In smaller communities, children were blessed in those days with big yards, or vacant lots, or various other natural playgrounds more or less hazardous on which to disport themselves. But even then, in the cities there was a crying need for recreational space and equipment. Mr. Walter Kilham puts it neatly when he says: "The cynical thought that no playgrounds were necessary since all the children did was to shoot craps and gamble with cards, while others said that even if we did have playgrounds, they would prefer the street. When we looked at the local school playgrounds, we agreed the street had more appeal.

"It is still an academic question whether to surface the playgrounds with concrete or asphalt. I never tried to slide to home plate on concrete in my youth, but I think I would rather shoot craps than try."

The cynical, although still in evidence, have been losing the battle. The need for recreational areas, integral with school plant, is accepted. Today one of the recommended standards — rule-of-thumb — calls for 250 square feet of net usable play space per child. The trend toward more and more space per child has been accentuated by the rising recognition of the common sense of the one-story schoolhouse. Add to this the necessity for school buildings to be set back from the streets, the desirability of pleasant site development, and the growing use of the school grounds by the whole community, and the minimum site area for any neighborhood must be figured in multiples of acres, rather than in square feet per pupil.

Today in many districts, education itself is moving out-of-doors. Physical education is no longer a series of exercises between fixed rows of desks—nor even indoor play alone. More and more of its program is taking advantage of the health-giving outdoors. Then, too, classes are actually looking at stars, watching birds, growing some plants and observing others in their wild state, learning conservation by practicing it. Standards for site size and character are not even determined by recreation needs in these systems nor by present and possible future building requirements. School and community planners are interpreting educational philosophy in terms of activities, activities in terms of space requirements. Site selec-

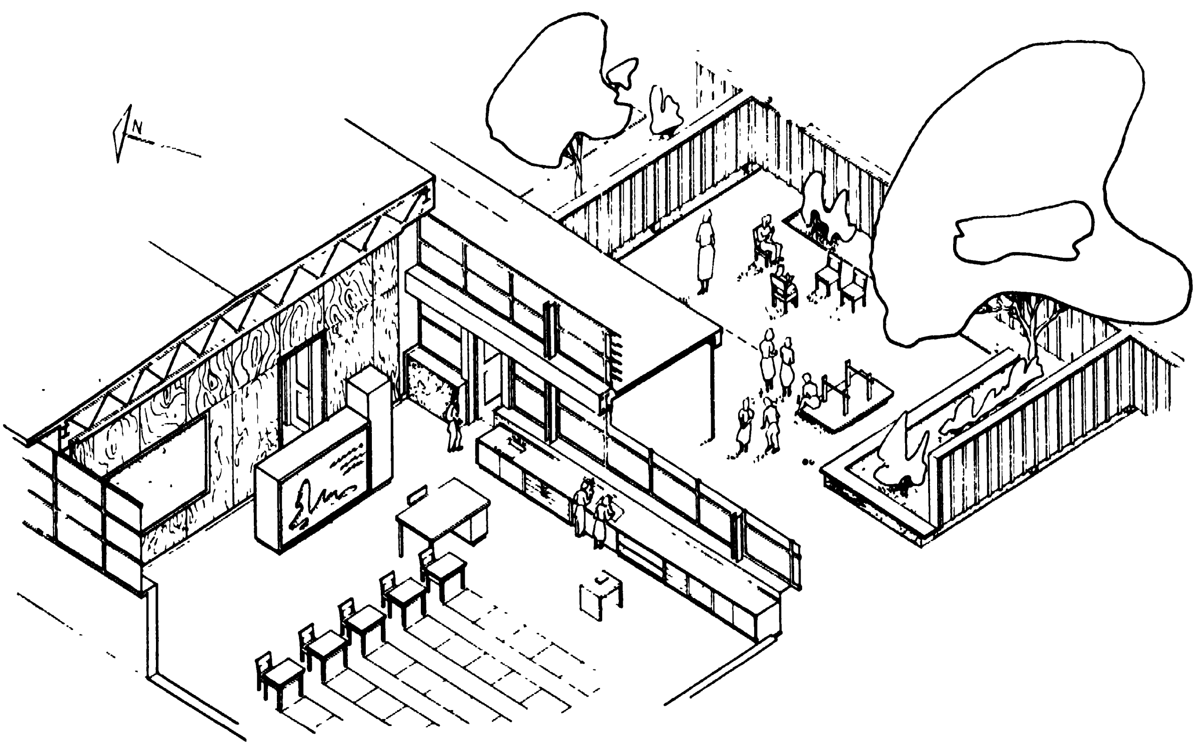


School at Fairfax, California. Bamberger and Reid architects.

Humble camp. Children of Humble Oil Co. employees. Courtesy of Standard Oil Co., N. J.

Flexible programs are possible with classrooms, covered terrace, and outdoor classroom at California's Claremont Elementary School. Marsh, Smith & Powell architects. Eaton photo.

Children learn in the outdoors as well as indoors. Space is needed. Outdoor classrooms in close proximity to the indoor classrooms are most desirable. School in Fairfax, Cal. Bamberger and Reid architects.



tion and landscape architecture are going functional, too.

There can be as much waste in the site and its development relatively as in the building itself. Obsolescence is equally a danger. Flexibility and expansibility equally important. The danger here lies in setting the sights too low in estimating needs.

Is the building to house kindergarten children? Then most educational philosophies specify opportunity for the little ones to have an outdoor work-and-play-yard all their own, separate from the older children's just as the indoor facilities are.

Is the elementary school program to provide outdoor education? Then informal play areas, nature walks, garden space seem indicated. Many go further and require an outdoor classroom immediately contiguous to the indoor one.

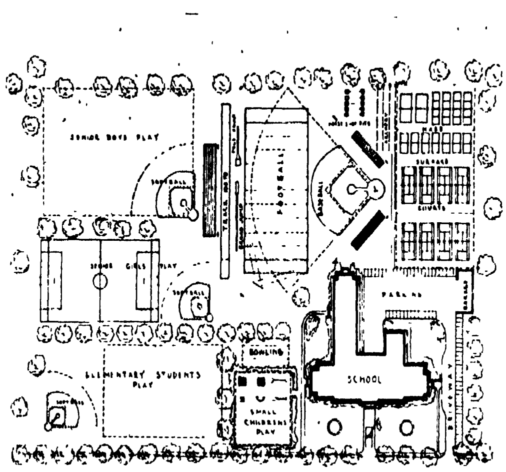
Is recreation to be for all children? To each according to his need and interest? To develop skills with high carry-over into adulthood? Then still other informal play areas are indicated. Apparatus serves useful purpose, but it too must be segregated for safety's sake.

Does the school dump its whole membership simultaneously onto the playground at a specified time for a fifteen-minute recess? That, too, has implications for nature and size of site development.

Having planned for the educational program of the school itself, next consideration should be given to the mechanical or relatively fixed requirements of the school as a place where people and things come and go. This means landscaping for esthetic and safety considerations: walks and drives well separated; service entrances planned for minimum confusion and danger; parking areas adequate in size and safe and convenient in location, according to the school and community needs to be served.

All this, before considering community needs as different and additional to the needs of the school and its children and program. When these are added, they too should be developed in terms of jobs required of the site. Standards are suggested, but their mention does not imply that the authors endorse them. The given community's standards are the thing.

One set of standards for site size is offered by Mr. Grier Reimer of Cleveland, Ohio, who had done some outstanding work in site research and development. These are based on school population and are cited as a sort of check against which a given community may measure its vision.

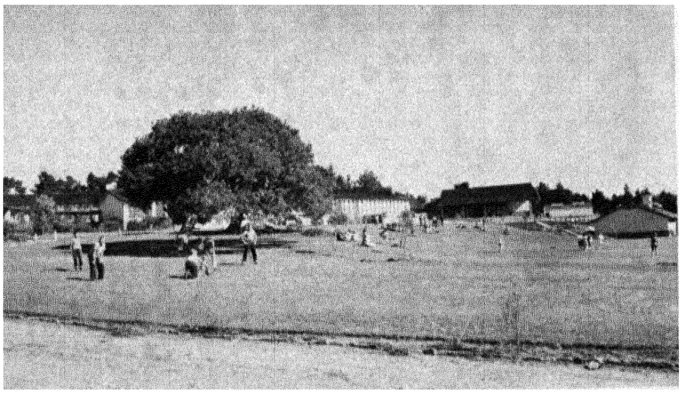


Out-door learning requires space—specialized space. None is wasted on a site that meets the need of all ages. Shirley & De Shaw architects.

Model for high school in Visalia, Cal. Note that the automobile is in Visalia to stay, as seen by space planned for parking. H. L. Gogerty architect. Vic Stein photo.

"They have interpreted the program in terms of space"—planned, useful space, serving the school and the community. Elton De Shaw, Shirley & De Shaw architects.

Field Day brings in the mothers and dads. John Gass photo. Scarsdale, N. Y. schools.



Rural and suburban children are used to space and lots of it. No 100 foot square of asphalt for them! Carmel High School, Carmel-by-the-Sea, Cal. E. Kump architect.

PUPILS PER ACRE

Minimum Ideal Urban		Adequate Suburban
80	Elementary	50
75	Junior High School	40
50	High School	30

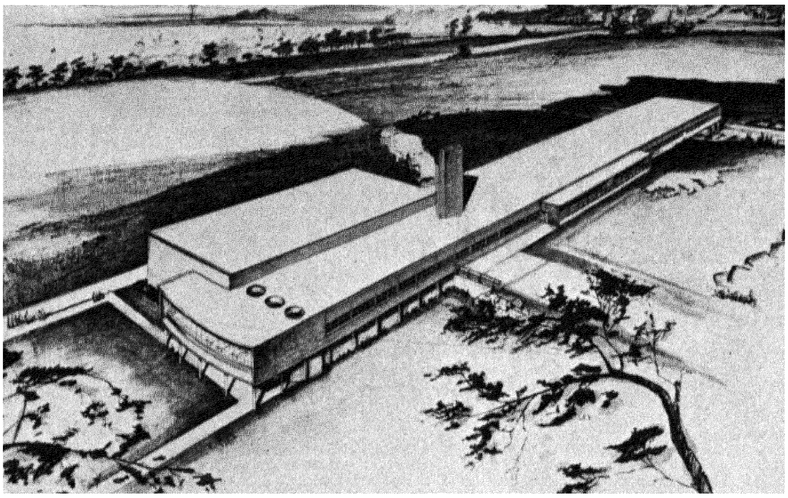
And why, it might be asked, should the suburban youngster be entitled to more space than the one who lives in the city? He should not. That is not the answer, however. First of all, there is the very practical consideration of the high cost of city property. And not that Mr. Reimer's standards for the city are tagged as "minimum." But that is not all. It is demonstrable that city children, while they need lots of space, *can* get along with less than those raised where the whole design of the community is drawn to a larger scale.

The National Recreation Association published (in 1943) a set of Standards for Neighborhood Recreation Areas and Facilities which may serve similarly in assaying the plan for community recreation provisions. They are not cited here. Not because community recreation may not be an important part of the school site function—rather because the community recreation needs vary tremendously, and the portion of them which must be met on the school site varies as greatly.

Securing sites adequate to meet such standards can present a headache to school administrators. It can be classified, along with many of the other headaches of school planning and administration, under the heading of growing pains. And those pains have been alleviated with signal success in many cases by cooperation between park departments and school boards. These civic bodies have pooled their resources and teamed up to fill community needs.

Take Glencoe, Illinois, for example, a Chicago suburb noted for its integration of school and community activities. Here the park district in one instance acquired 7½ acres adjoining a 4½-acre school site. In another joint project the park district and the schools developed and improved a 17-acre site, of which 5 acres belong to the schools. And on another large site on which a splendid community auditorium had already been erected, the park and school organizations worked together in creating additional recreational facilities for the community. The school parks and the school buildings have been "designed to meet the recreational needs of the community and the educational demands of the school" to an unusual degree.

John Burnett Parkin, Toronto architect, met an unusual problem in designing this high school for Parry Sound, Ontario. It was literally a hard problem—a granite shelf underlying the site. Basement for boiler room would be impractical so Parkin designed the building to conform to the contours of the hillside, thus minimized blasting.



Incidentally, the superintendent of parks takes complete charge of care and maintenance of all Glencoe school grounds. He gets full cooperation from the school, for tending the shrubs and other plantings is made a part of the curriculum—a school project in which even the youngest take part. While planting and tending these growing things, the youngsters are learning—and they love it. The project has developed a sense of responsibility—a proprietary interest—that has cut damage and replacement costs markedly.

In Cincinnati, in 1932, the recreation commission had only a small operating budget, but considerable municipal bond funds were accessible. So the commission decided that future land for playgrounds and playfields should adjoin schools wherever possible. Within ten years the commission owned or leased and maintained play areas at eighteen elementary and five high schools. It entered into an agreement with the board of education to lease school properties and pay for cost of construction of playfields. In return the board of education contributes a share of the operating costs. Both the school board and the park board are represented on the recreation commission.

Fort Worth is another of the cities that are making these concepts work. There are others. Their number is growing. The pattern is one of increased size. More importantly it is one of genuine study of present needs, of probable growth of those needs—and changes in them. Sites are being planned to fit the function.

Every planner should know the importance, in site selection, of knowing all there is to know about the very land itself. The nature of the soil: Is it suitable for the superimposition of a heavy building mass? The contour: Is it well drained? Can it be drained at minimum expense? Does it adapt itself to efficient site? What problems—and these always wind up with a dollar sign attached—does it pose as to soil movement, excavation, filling?

Recent studies have shown that site location and landscaping bear importantly on climate; actually climate within climate, the very climate of the site itself. Somebody named this sort of knowledge, or search for knowledge, microclimatology.

The lore behind this formidable term provides interesting data on the microclimate of a site—data which can, for example, be translated into fuel costs for winter heating. A difference of only twenty-five feet in elevation can cause measurable differences in temperature and humidity.

Vegetation too can influence site temperature measurably. Windbreaks cut wind velocities as much as 20 per cent, and can thus appreciably reduce heating bills. And on warm days, vegetation reduces temperatures in two ways: (1) shade, or reduction of radiant heat from the sun; (2) vaporization of moisture given off by foliage.

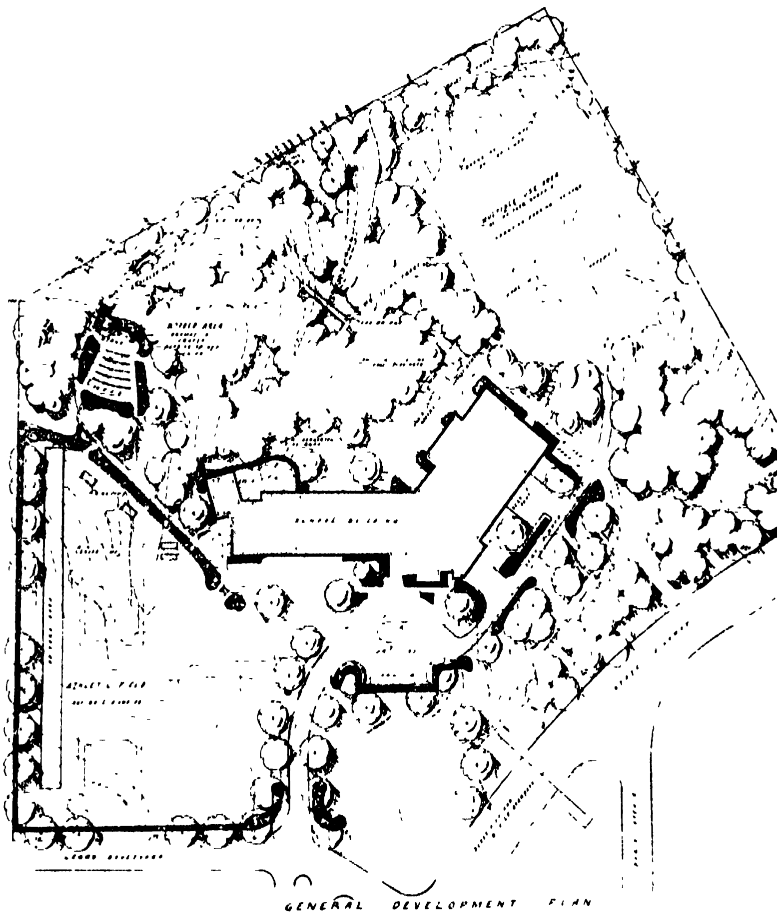
Vegetation acts as a filter, too. "Measurements have shown that a 600-foot wide belt of planting can reduce dust count as much as 75 per cent. Even lawns act as dust filters." And trees and shrubs wisely planted filter out sound, too; keep the noises of the playground from disturbing the classroom.

Perhaps no other phase of school planning requires so much information from the community as does that of selecting the school site. Here again—in choosing a site and planning for its most efficient use—is shown the need for the intelligent study, assisted by expert knowledge, of the individual problem for the individual site for its individual neighborhood.

That proposed site over there on Washington Street may be available at a bargain. But will it be a bargain? Can it meet your standards, the criteria you have set up? No matter how good it looks, from the street or on paper, it should be studied objectively in the light of full information, detailed information—graded against certain standards such as the criteria set up, for example, in Cincinnati, where the following are among the factors taken into consideration:

A. Accessibility.

1. Travel distances, not just in terms of geographical measurements from the school to the boundaries of the area it serves, but a detailed census, showing the number of pupils by travel zones, such as half-mile walking zones.
2. Vehicular transportation. How many pupils ride to school? How do they ride? If they use school transportation, how best can the school bus be routed for the greatest good for the greatest number? If they use public transportation, how many require transfers, how many travel in the same direction as business people going to and from work?
3. Traffic hazards. How many pupils have to cross how many major streets? What is the traffic flow on these streets, and at what hours does it reach its peak? What has been, according to police records, the pedestrian accident



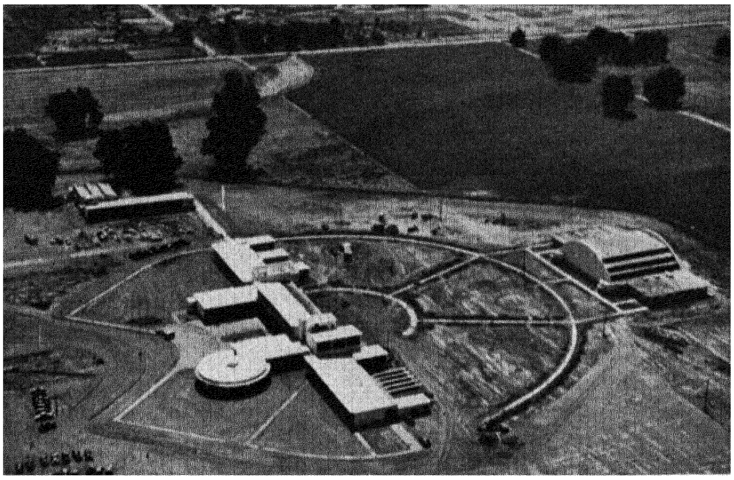
Woods, hills and a natural amphitheater are features which serve school and community. Site development is more than turf and paving. Reservoir Heights Elementary School, Peoria, Ill. Scruggs & Hammond landscape architects. Carter E. Hewitt & Rudolph L. Kelly architects. Courtesy *The American School and University*.

history of these major intersections? What are the present and possible accident safeguards?

4. Undesirable travel conditions. A thorough check should be made on every route every child must take to and from school. Are there any routes which contain no sidewalks, or bad sidewalks? Are there ups and downs in the terrain which might prove hazardous or exhausting? Are there sub-par industrial areas, infested with cheap saloons and other skid-row establishments, through which the pupil will have to walk? Will the pupil travel through busy commercial or industrial districts, where he will be exposed to the dangers of truck or railway traffic?

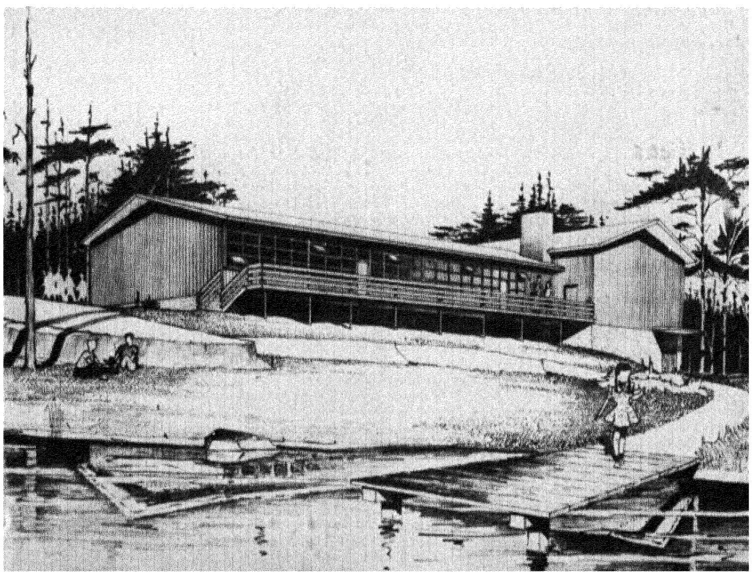
B. Environment.

1. Type of district. What is the district used for now? For what, and against what, is it zoned? What are the probabilities as to its future use and zoning? How close is it to the nearest concentration of business or industry?
2. Atmospheric conditions. Smoke, dirt, and odors adversely affect health and comfort. They can also deliver telling blows to the pocketbook section, making operation and maintenance costs soar.
3. Noise. Is the site in a zone of relative quiet? There is a lot of noise available in every city—clattering factories, rumbling trucks, screeching street cars. screaming automobile brakes, wailing sirens, chuffing trains, roaring airplanes, clanging fire bells—and all these noises seem to become magnified when they seep through school windows, because of the relative quiet of the classroom. Noise can be screened by judicious planting of trees and shrubbery, but only partially. It is well to remember that as far as exterior noises are concerned, distance lends enchantment.
4. Light obstructions. There are known to be schools which are strangers to sunlight because they are nested among taller buildings as if they had been deposited at the bottom of a well. This is somewhat less than ideal, to understate the matter. Natural sunlight is good, and it is free. The prospective site should be surveyed for any light obstructions, present or contemplated.
5. Proximity to other public facilities. Much has been written and infinitely more has been said about the increasing importance of the school as a center of



Pleasant and practical composition of buildings on extensive site for Visalia Junior College, Visalia, Cal. H. L. Gogerty architect.

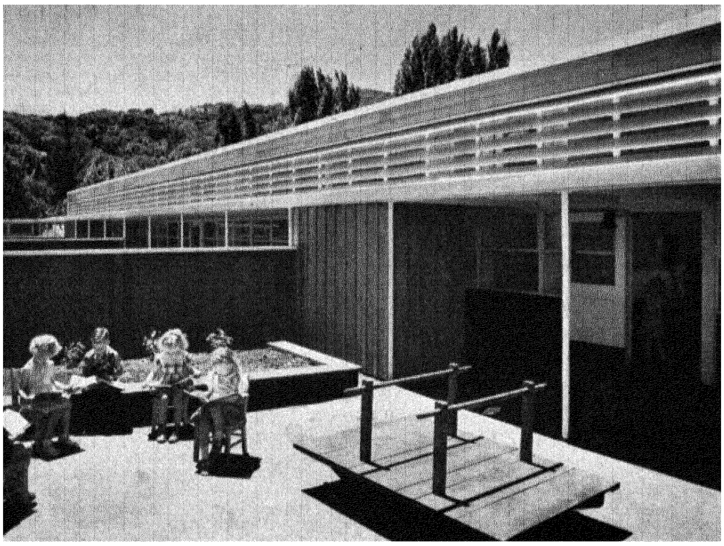
This elementary school at Point Au Barie, Ontario, perhaps on a rocky peninsula in the Georgian Bay region 175 miles northwest of Toronto, is accessible only by water-borne transportation. Tough digging here, so the concrete block foundation is almost entirely above grade. More important, however, is the way the structure—exterior log siding, casement windows in wood stops, duckboard playdeck becomes part of its north woods setting so admirably. John B Parkin Associates, Toronto, architects.



community activity. It stands to reason, then, that the library, the park, the playfield, would be natural neighbors for the school.

6. The vista. What is the view that meets the eye? Is it pleasant or unpleasant, stimulating or depressing? Esthetic values are hard to define, and their influences on growing children are difficult to measure; but plain common sense can differentiate between a "good" view and a "bad" one. And if the view in all directions cannot be wholly "good," the site should accommodate such planting as will help remedy the deficiencies. When the child looks out upon dingy squalor, he is likely to assume, chameleon-like, the spirit of the environment. Give him beauty or at least a relief from ugliness. Expand — with windows, with a view — his physical horizon; and you will be helping extend the limits of his mental horizon, too.

The value of esthetics is hard to measure, but an environment of beauty can be a joy forever in the lives of children. Fairfax School, San Francisco, Cal. Bamberger & Reid architects. Roger Sturtevant photo.



C. Size.

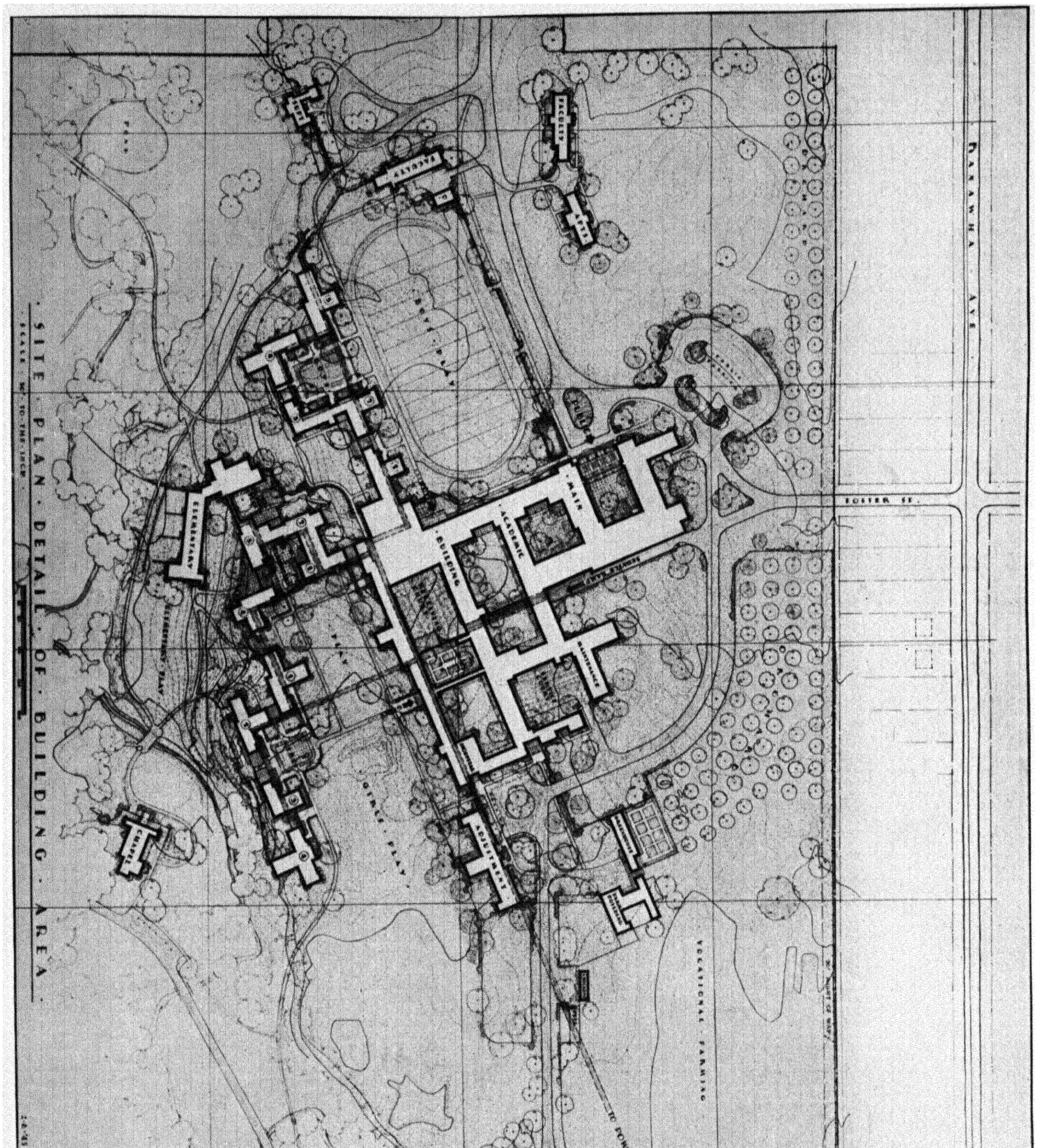
This element in site selection grows more important every year. It is even more important, in the opinion of many, than accessibility. These thoughtful planners argue logically that the school bus solves the time-distance problem. As an example, shortly after World War II the City of New York bought more than 100 acres on the northern tip of Manhattan Island for schools that in grandfather's day would have been crammed into crowded neighborhoods. The first consideration, the statistical factor of play area per pupil, is important. But the question of size goes far beyond that. It is important that the site be large enough so that the school buildings and play areas can be removed from the street. Adequate parking space is a necessity. Provision also should be made for expansion, additions to the plant. And additions to the site itself should be considered.

D. Form and Orientation.

Can the shape of the site be used to advantage in placing the school building? What is the site's particular microclimatology? Can the necessary orientation of the building be accomplished within the bounds of good common sense?

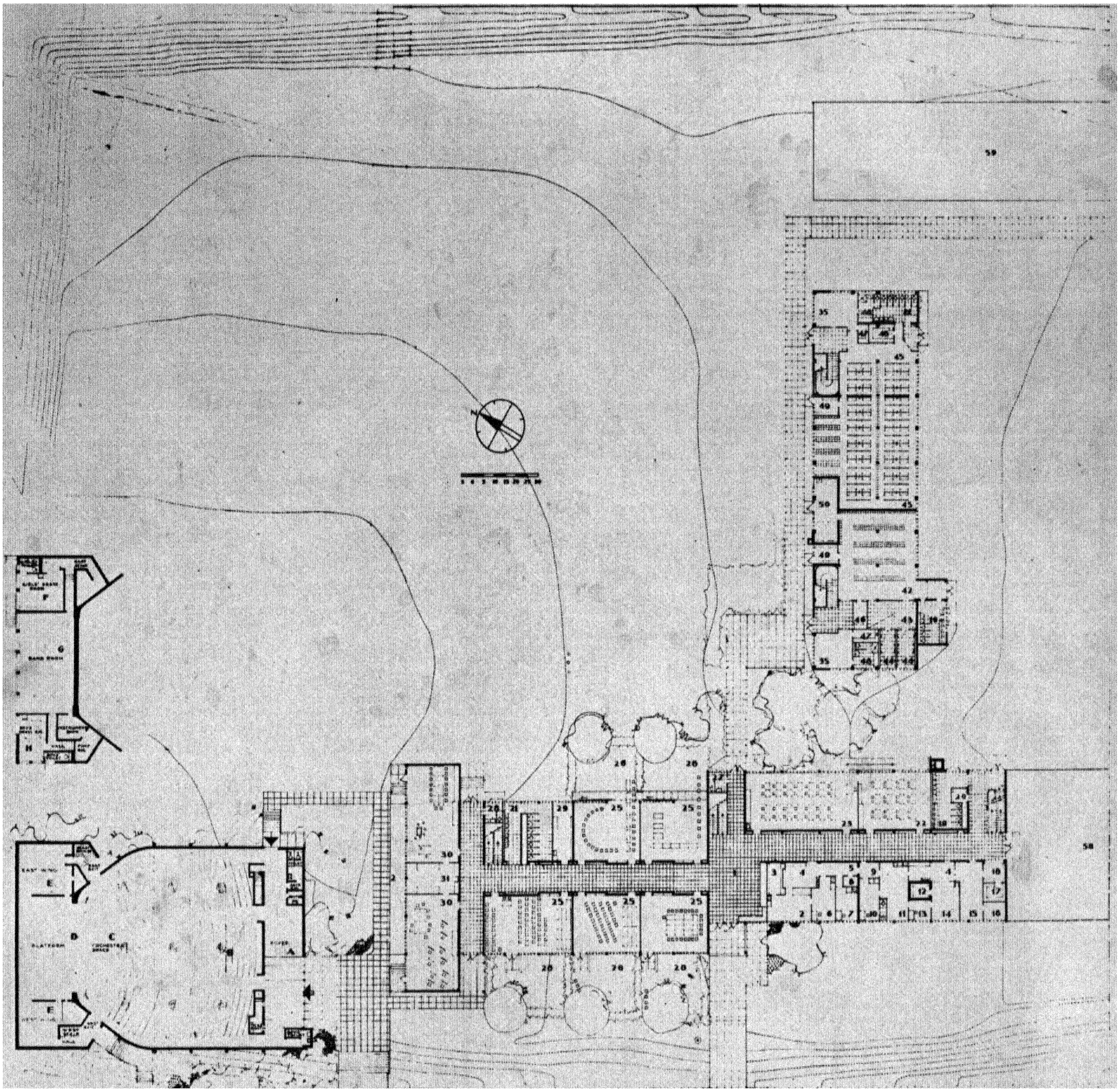
E. Topography and Soil.

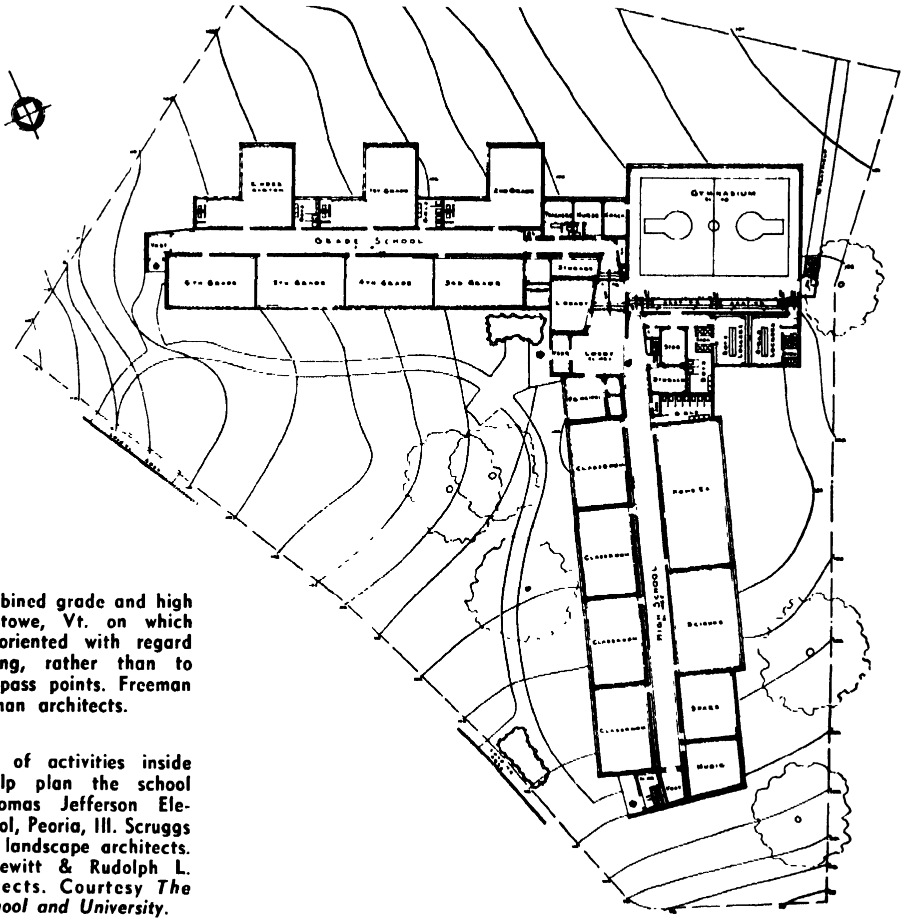
What do best borings show to be the nature of topsoil and subsoil? Are they favorable to the support of the mass of the building? Are they favorable to growing grass, trees, shrubbery? To the laying



Today's buildings require more land; today's program much more still. Outcalt-Guenther & Associates architects.

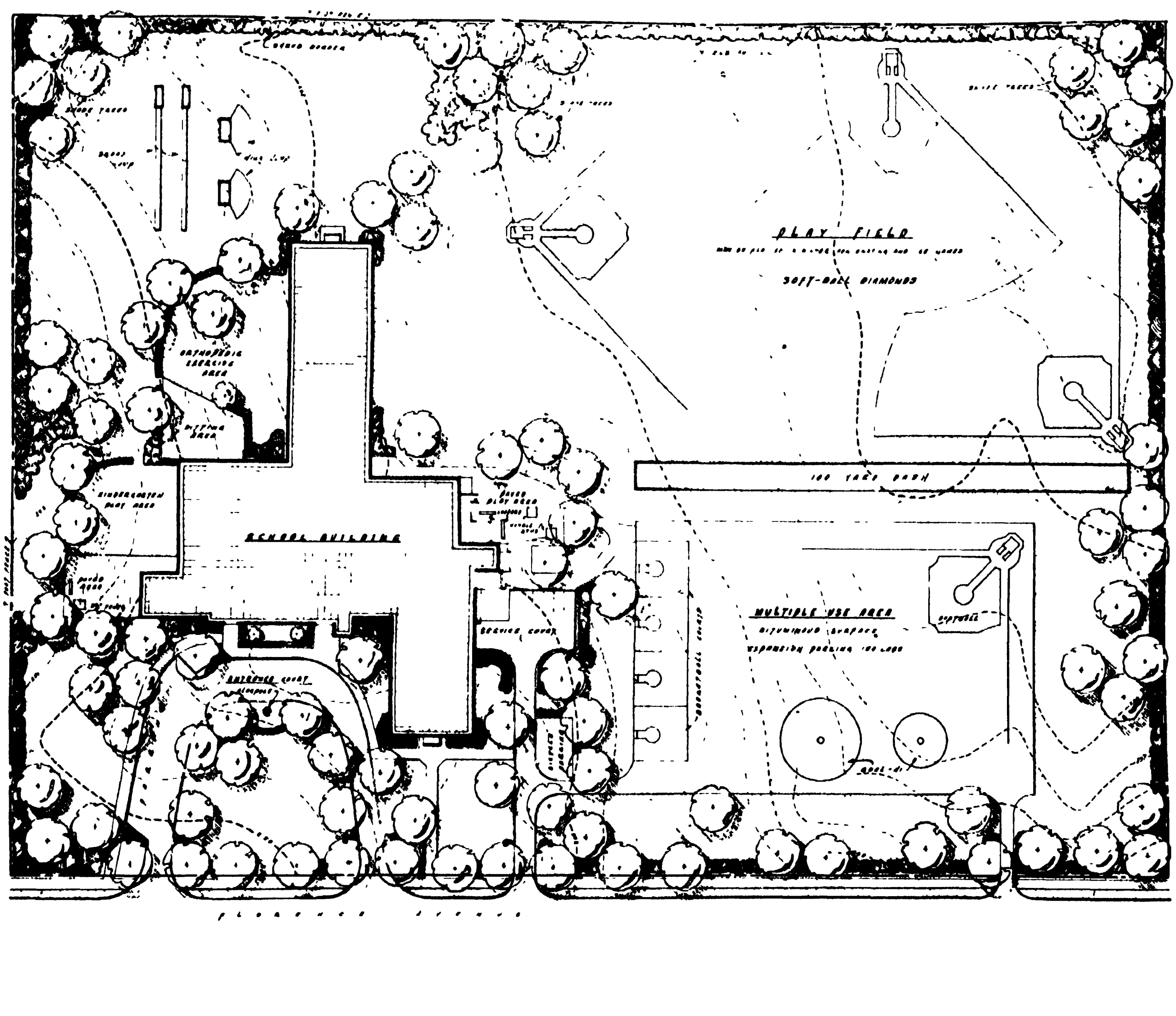
The cardinal points of the compass take a back seat in this plan for the Ralph Waldo Emerson Junior High School. Orientation here is more concerned with fitting the plant to the site contour. Richard J. Neutra, architect.





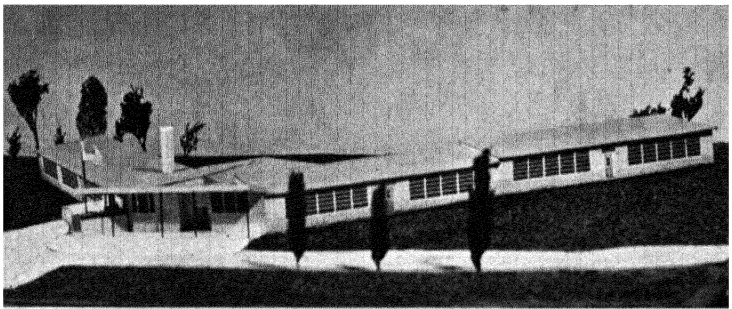
Plan for combined grade and high school in Stowe, Vt. on which building is oriented with regard to its setting, rather than to cardinal compass points. Freeman French Freeman architects.

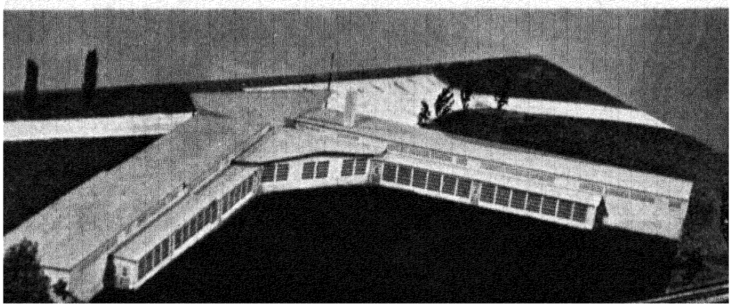
Relationships of activities inside and out help plan the school grounds. Thomas Jefferson Elementary School, Peoria, Ill. Scruggs & Hammond landscape architects. Carter E. Hewitt & Rudolph L. Kelly architects. Courtesy *The American School and University*.



of walks and driveways? How extensive and how costly will be the necessary grading, excavating, installation of drainage systems, protection against seepage and flood waters? Finally, of course, what is the cost?

Evaluation of a site is never a simple matter. But it becomes less complex when definite standards are established. A cogent argument in favor of official criteria is given by Mr. John H. Herrick in reporting on the Cincinnati school site program:





Cramped sites may relegate additions to the status of ugly, inefficient patchwork. Plenty of room on the site means room for growth, makes possible tailor-made additions like this primary school in Indianapolis. Perry Township Primary School model. Lennox & Matthews architects. De Soto photo.

"Most of the advantages of the use of definite standards could be secured without formal adoption of criteria by the board of education. Such adoption, however, seems to have two strong points to recommend it.

"In the first place, the superintendent is in better position to discharge his responsibilities in making site recommendations when such an official guide is available. He knows the standards to which he must work, and he has a pattern for guiding board discussion of his site recommendations. The chances of having his recommendations upset by last minute proposals at board meetings are reduced. When such proposals are made, his recommendation that time be given for checking against the criteria is likely to be accepted.

"A second advantage of formal adoption of site criteria by the board of education is that the hands of the staff and the board are strengthened in disposing of proposals of little merit. The enthusiastic advocate of an unsatisfactory site is by no means a rare individual when public funds are to be spent, and the added support of officially adopted standards is often most useful in bringing to a close what seems to be interminable debate concerning the merits of his proposals."

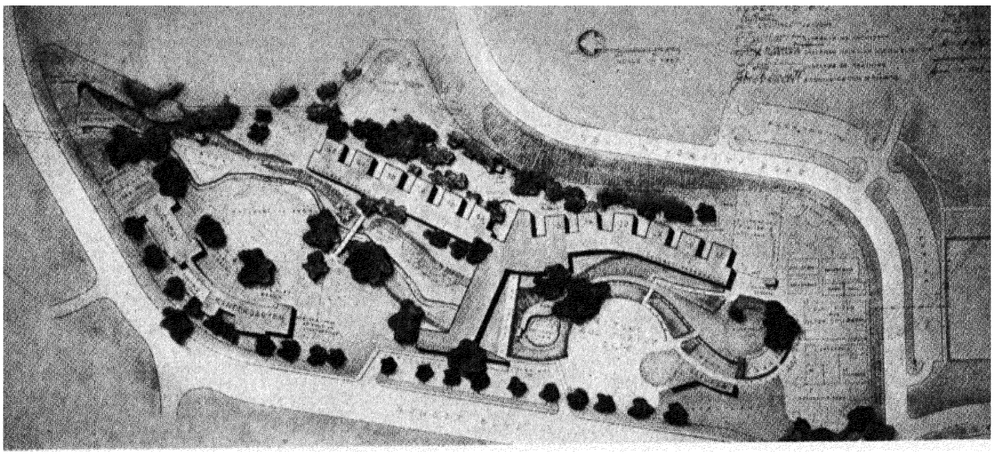
The trend in site selection is toward size—lots of it. In a given situation this does not just come. Thinking has taken place—thinking on the part of more than the administrator or the architect or the school board. The people have met and planned—with or without the services of an expert. They have set down their educational philosophy, their hopes and aspirations for the neighborhood community. They have interpreted the program in terms of space—have measured horseshoe courts, picnic requirements for a neighborhood gathering, apparatus needs, wet weather play areas, softball diamonds, gardens, parking and a host of other needs real and imagined. They have weighed them, looked for ways to get several kinds of use out of the same space, conceded that some needs are more immediate to a larger number than others. When they were all through they

came up with specifications for a school site that they can and will defend—one that has exceeded anything the school administrator has dared expect—one that provides for the real needs of the school and community now and in years to come.

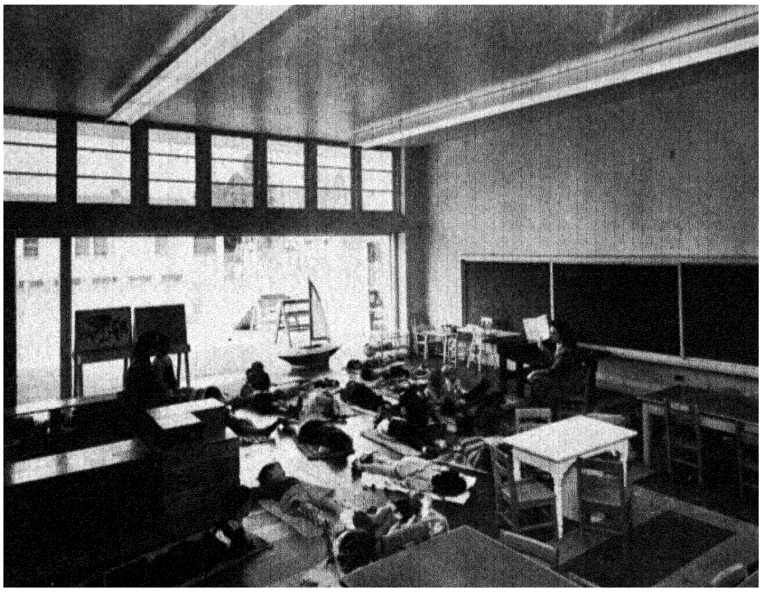
The architect's job is to figure the foundation needs of the building itself, present and future, and add these to the educational and recreational requirements worked out by the people and the school staff. Then is the site size and its character determined. That kind of selection sticks.

New York City's move toward larger sites has been mentioned. It is an example of the advanced realistic thinking that distinguishes the planning of a growing list of cities. Baltimore schools own acres and acres of beautiful land that is now mostly wooded parkland, with room for idyllic walks—and room for the future. Oklahoma City, looking for a site for a new high school, chose an entire square mile—640 acres—on the edge of town. So it goes, and it is good. In the words of that great architect, Daniel H. Burnham, "Make no little plans."

The whole plant must be projected before wise planning for site utilization is possible. Robert E. Alexander architect. Ralph D. Cornell resident landscape architect. Courtesy *The American School and University*.



CHAPTER 2: General Aspects of Educational Buildings



Schools are no longer just buildings. Today's school is an indoor-outdoor place, helping bodies and minds to develop. Courtesy A. M. Byers Co.

There are critics who maintain that architects and kindred souls make too much use of the word "function" and its relatives. We give fair warning, without apology, that "function" and words of similar import will be found in these pages again and again. For the very essential purpose of building, of building anything, particularly of building schools, is to build them so that they do a job, so that they "function." The primary question is: What is the job to be done? The next question is: What is the best way to do that job?

The first important mistake is made when there is a misunderstanding of function, an ignorance of the essential job to be done. Such misconception used to be amusing when the vaudeville comic soberly suggested that the function of a bridge was to keep the rain out of the water. But misunderstandings about the function of school buildings can be tragic, and costly.

The job of the school building has changed, is still changing, growing, diversifying. Where formerly the school building was accepted if it kept out the rain and the cold while the inmates were being injected with the rudiments of reading, writing, and arithmetic, such minimum evasions of mass illiteracy are not acceptable any more. The school must now prepare each individual to live as happily as possible in his world at the peak of his productivity. That takes more than the three R's. It requires the development of understanding. It means learning more than what and where and when and how many—the thing, the place, the time, the number; it means learning *why* and *how;* absorbing an active interest in the relationship between the individual and the group with which he lives. But the job of the school today—because it is centered around the development of the individual—necessarily goes further. It extends to all the other people, of all ages, in that child's community.

The improvement of the quality of living is the chief goal or purpose of education.

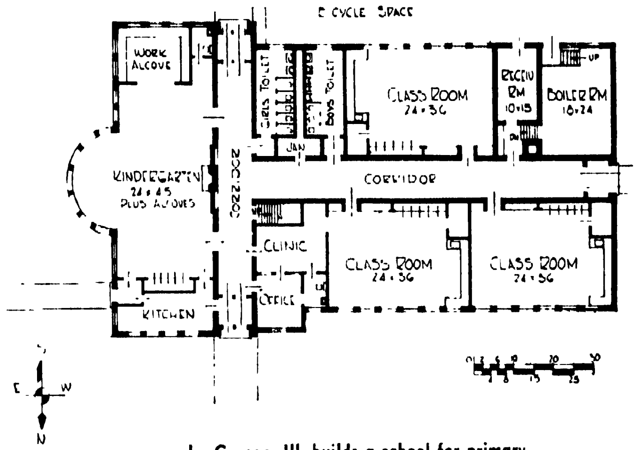
Lobby in Crow Island School, Winnetka, Ill. A popular gathering place for parents. Eliel Saarinen—Eero Saarinen, Perkins, Wheeler & Will architects. Hedrich-Blessing photo.

The American people have established schools to devote their entire energies to fulfill this purpose. All their activities, all services they provide, all the energy of their personnel, all their facilities should aid in the accomplishment of this task.

The educational plant consisting of grounds, buildings, and equipment, therefore, provides a facility which should be planned, designed, constructed, and used so that it makes possible better living in the community in which it is located. The plant has several special functions: (1) It should provide facilities needed by the entire community—meeting places, facilities for luncheons and dinners, laboratories and shops where people can make and repair things, library materials, audio-visual facilities, recreational facilities, demonstration plots and laboratories, etc. (2) It should provide facilities particularly planned and designed for the full-time use of a particular age-segment of the community; i.e., for very young children or a nursery school; for children ages 6-12 or an elementary school; for children of early adolescence or a junior high school, etc. (3) It should provide facilities for the types and kinds of activities necessary for the instructional program which will be carried on; i.e., the teaching of reading, the teaching of music, the teaching of games, the teaching of how to raise poultry, etc. (4) It should provide facilities for the services which the community needs from its schools; i.e., physical examination facilities, lunchroom facilities, recreational facilities for children, group meeting place facilities, etc. (5) All its facilities should add to physical comfort and well-being; i.e., through proper lighting, control of sound, body temperatures, ventilation, etc. (6) It should add to emotional stability and growth by being esthetically comfortable. "Beauty derives from order and harmony and balance of parts within a whole."

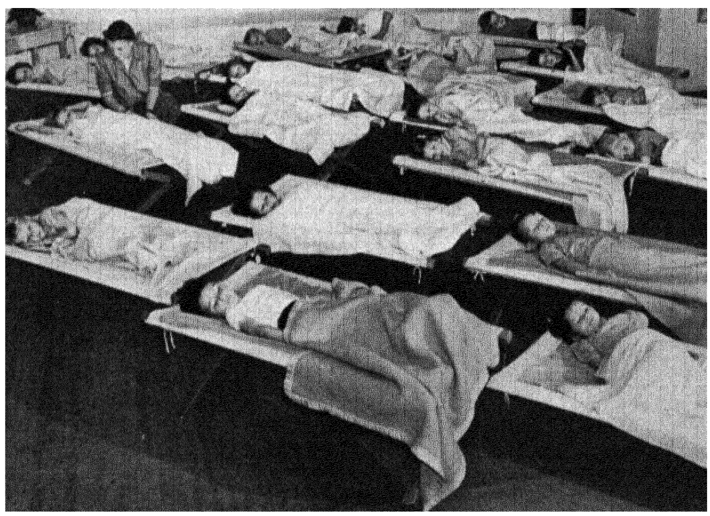
The creators of an educational plant, then, are faced with a compelling and adventurous undertaking. It takes a lot of doing but its satisfactory fulfillment is a social good of extreme importance.

In serving that community, and each individual in it, the people who plan and run the school narrow the definition of the job. Who are the individuals? What niche will they likely fill when they leave school? Will they likely enter a trade, such as metal working? Will this environment channel their lives into agriculture or ranching? Or will they rocket from a polite suburb into the ethereal reaches of Harvard? Answers to such questions as these help determine how



La Grange, Ill. builds a school for primary grade children near their own homes Courtesy *The Nation's Schools.*

Today's school is a service center—for health examinations. United States Office of Education photo.



Learning by doing The flexible classroom becomes a nook in the Navajo country as children work on an Indian study project. Their imaginations and energies are turned loose on supervised creation of Indian artifacts—a hogan, rugs, tom-toms, costumes. Eliel Saarinen-Eero Saarinen, Perkins, Wheeler & Will architects. Hedrich-Blessing photo.

Schools again serve "around the clock". Playrooms for children by day, for neighbors by night. John Gass photo.

much space and emphasis to give shops, laboratories, farm and livestock projects, and the so-called arts.

And what of the community: Is it active, or could it be encouraged to be active, in after-hours activities at the school plant? What are the recreational folkways of the group? How best can the community's needs be served by the school plant? Do outdoor recreational areas alone suffice, or can the school's other facilities—cafeteria, auditorium, audio-visual room, laboratories—be put to efficient use in bringing a richer and more active life to men and women past formal school age? How best can the school plant earn its cost by plowing back into the community fruitful understanding and enjoyment of a life that grows increasingly complex?

Alas, the exact form of such utopian targets as ideal community life cannot be agreed upon even by the philosophers, who are expert in such matters. But the use of the school plant as a community center is an ever-growing reality, and the need for more and better school facilities is a fact that every community must face or fade from.

There was a time when the little one-room schoolhouse served its community—particularly in rural areas—almost around the clock. It was the meeting place, the social center, the forum and the polls where community problems were shaped. Then came diversions. Eventually the schoolhouse became a pile of congealed community pride, used only a few hours a day, five days a week, nine months a year. It is a strange commentary that almost every school board in those days was made up, at least in part, of businessmen who had achieved success through business acumen. Yet if they had allowed the private properties over which they had authority to serve on such a part-time basis, they would have been either banished or bankrupt. If, in those days, special interests were served under the guise of community pride, and the public be damned, it might be well to note that there are signs of change: The public is rising up and refusing to be damned any more.

Some of the most encouraging progress in the planning and building of schools has resulted from a more practical approach to the investing of public funds. If the industrial tycoon could throw away the crenelated towers and the useless pediments and spend that money for greater productive efficiency, it seemed obvious that money spent on public schools might also be invested more efficiently. Thus, during the past twenty years and more, school buildings have been designed more exactly for the job to be done. The frou-frou and the lace are disappearing. More and more school planners and administrators—and the taxpayers themselves—have come to realize that the gorgeous robes of Gothic splendor usually covered a community hair shirt.

But there are still those, who can very aptly be called "of the old school," who sputter that this "streamlining" of the school building takes away the dignity and impressiveness which should be associated with education. It is admitted that the pompous big boxes built so epidemically fifty years ago were at once supposed to awe and to give, by their very colossal dignity, something to aspire to. Often, however, the young rebels who were supposed to be impressed aspired only to break windows, a speedy and projected method of thumbing the nose, throwing the snowball at the silk hat.

There were good reasons once for Greek architecture. Sound, practical reasons. Also for the architecture known as Romanesque and for Gothic, and for most of the other known schools of putting up buildings. Each in its day was as modern as the architecture known as "modern" today, because each took the utmost possible advantages of the known materials and techniques. But in those distant days, builders did not have structural steel, reinforced concrete, areas of glass, and many other modern materials to work with. Should we copy them just because they could not copy us, and thereby penalize ourselves? The answer—particularly in buildings that must make every dollar do its biggest job—is increasingly no!

Orientation

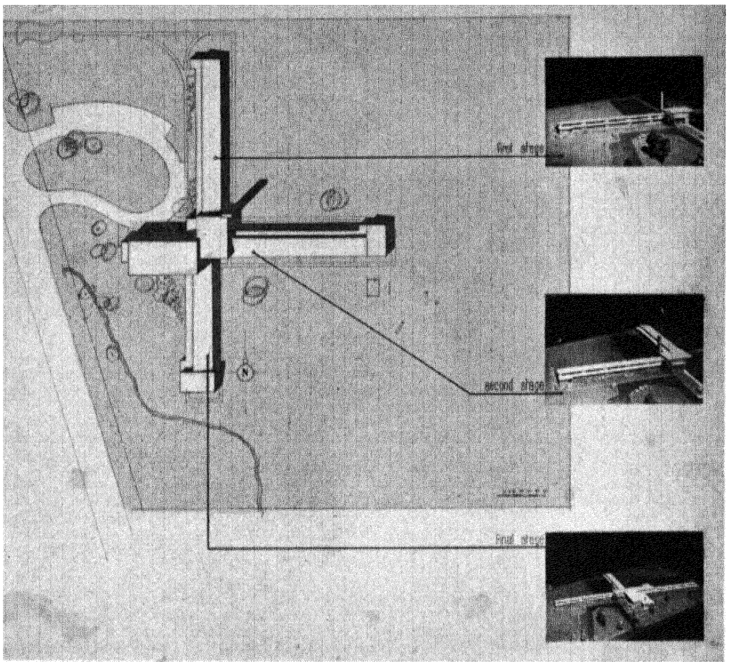
What should be the orientation of the building on the site? There are two ways of deciding. The first is the old way, which followed blindly as the dead hand of tradition pointed. The second involves going back to that first principle: a study of the specific job to be done by the specific school for its specific neighborhood and community, taking advantage of the peculiarities of its specific site. Tradition might say that the school should face due east or due south. The second method might agree, but the chances are it would orient the school some other way, if only by two compass points. For instance, now we know more about daylight, and how to control it. There's much more to know. The planning authority and the experts it employs should know the specific topography, microclimate, prevailing winds, location of present or planned vegetation, intended plant expansion—and dozens of other factors—before deciding orientation. These factors can be determined. And they are important. They can affect the first cost, in such ways as taking advantage of contour to minimize earth-moving, foundation-laying, and landscaping costs. They can affect maintenance costs by using wind shelter to keep down fuel bills. Most importantly, they can affect acoustics, illumination, and ventilation, and thus help the school do its job better.

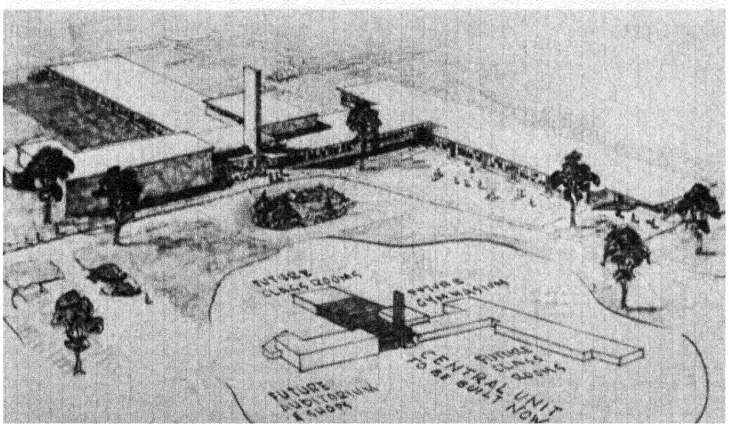
The orientation part of the planning should also consider the extent of the school's role in its after-hours community services, in order to design efficiently for walks, drives, and parking areas; convenient access by the public to such rooms as the cafeteria and auditorium; simplicity of traffic control over the entire site.

Expansibility

Death and taxes are not the only sure things. There's another: steady, unremitting growth in school population. This is true even in older areas where population has

You can't lay bricks all at once. You lay them one at a time. You can solve overcrowding problems this way, too, as the Glenview, Ill. school board did during the war. Glenview's Rugen Elementary School grew a wing at a time, as illustrated above. Each wing houses separate age-groups, while the common facilities—also for community use—are grouped at center. First to be housed were intermediate grades, in the north wing completed 1943; next, upper grades, east wing, 1945; finally, lower grades, 1946. Perkins & Will architects. Hedrich-Blessing photo.





Build now for present needs—and dollars—but plan for future expansion. La Salle School, Creve Coeur, Ill. Perkins & Will and Carter E. Hewitt architects. Hedrich-Blessing photo.

remained relatively static. It is violently true at this writing in the South, Southwest, and West. It is caused by nature and the birth rate. It is caused in some communities by population shifts. And it is caused everywhere by the increasing number of years people are using schools.

One way to plan for the specific school's increased needs is to estimate the increase in school population over the expected life of the building, then build to meet it all at once. A newer way is to *plan* for expansion, but *build* only for immediately foreseeable needs.

Building now for expansion later is not a job to be left blindly to fortune tellers. It is a job that requires careful planning.

First of all the site must be adequate not only for today, but for tomorrow, large enough to accommodate the new additions which will be built according to plan, five or ten or fifteen years hence. This may call for leaving part of the site undeveloped for a period, until such time as it is needed. Or it may suggest selection of a site adjacent to property which may be acquired in the future.

Buildings should be located so that they will fit logically into the pattern of growth. They should be oriented so that as the expansion develops there will be no interference with proper sunlight and ventilation. Sewage disposal systems should be built oversize and located out of the way of the planned building extensions.

The National Council on Schoolhouse Construction has set down some suggestions which make the job of building expansion a lot easier and a lot less costly.

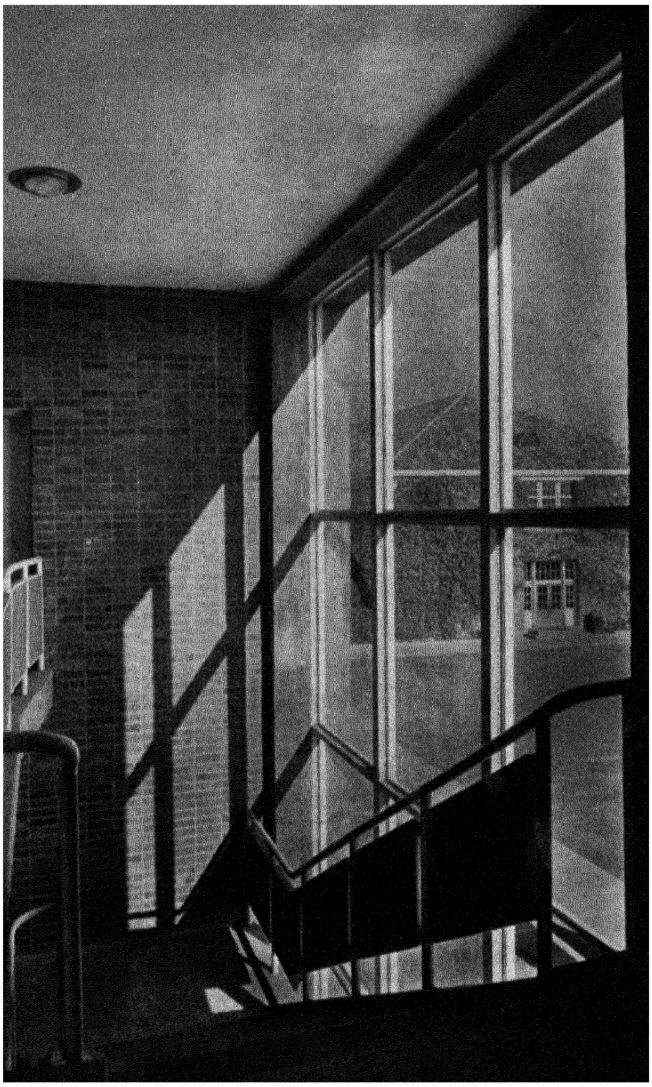
The Council suggests the use of a one-story single-loaded corridor type of plan. It is a plan that has many advantages over and above its adaptability to growth. Additions become, in fact, more extensions limited principally by the size of the site.

In a plan for growth, corridors should be carried through to outside walls, or at least to very small temporary rooms.

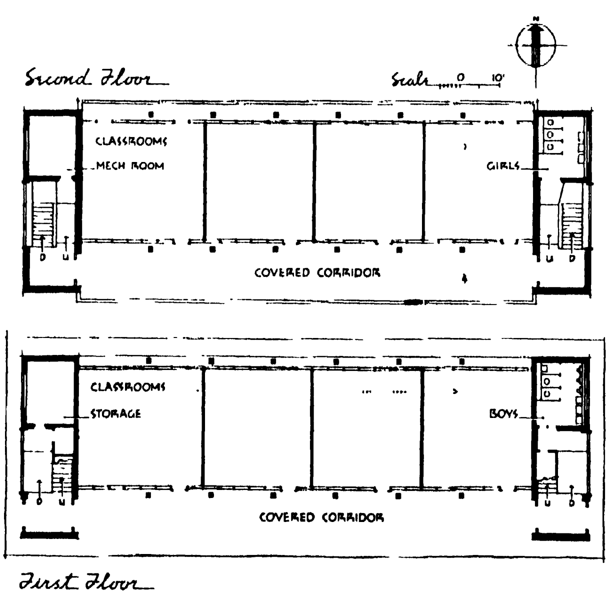
If the building has to be multi-story, its stairs will present a problem. But the problem will not be nearly so great if stairways are placed in separate enclosures off the corridor, rather than at corridor ends.

Any wall which will some day be removed to make way for additions should be regarded as a temporary wall, even though it stays intact for three or four years. Obviously, such a wall is not the wall for essential windows.

And it is extremely important to keep the plan for growth in mind when locating the heating plant, laying out the plumbing and electrical systems.



Stairways off the corridor allow for later expansion. Kump & Falk architects. Courtesy *Progressive Architecture.*



Expansibility of the old-style multi-storied ornamented box was a virtual impossibility. As school population grew, classes became crowded to bursting. The educational processes suffered. Fire hazards became greater. Relief was usually found in emergency construction of jerry-built "annexes" located haphazardly on the original school site.

Today's skeleton-and-skin construction is better adapted to planning for expansibility. Additions to the main plant, or planned-for separate buildings, may be constructed as the need for them arises.

Flexibility

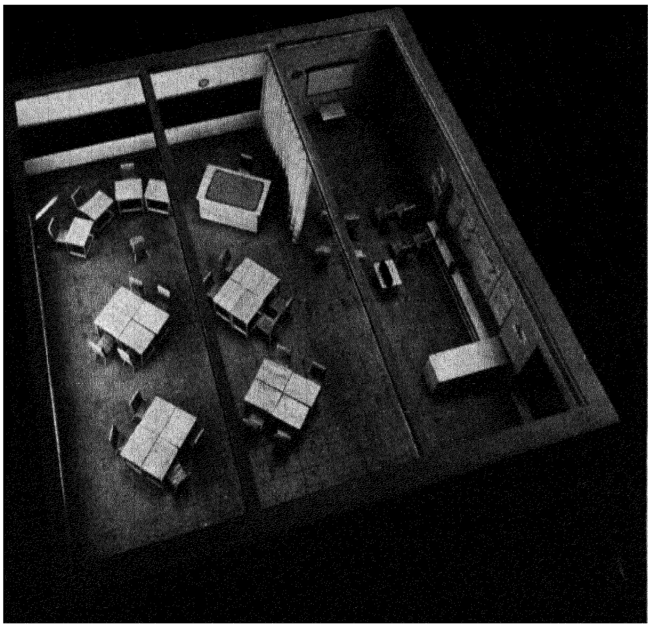
The modern school can adapt itself in size, to meet the growing statistical needs of its community. It can also adapt itself organically and inwardly to meet curricular changes. This flexibility not only can enhance the school's value to the pupil and to the community; it can also effect extremely worth-while economies in construction and upkeep.

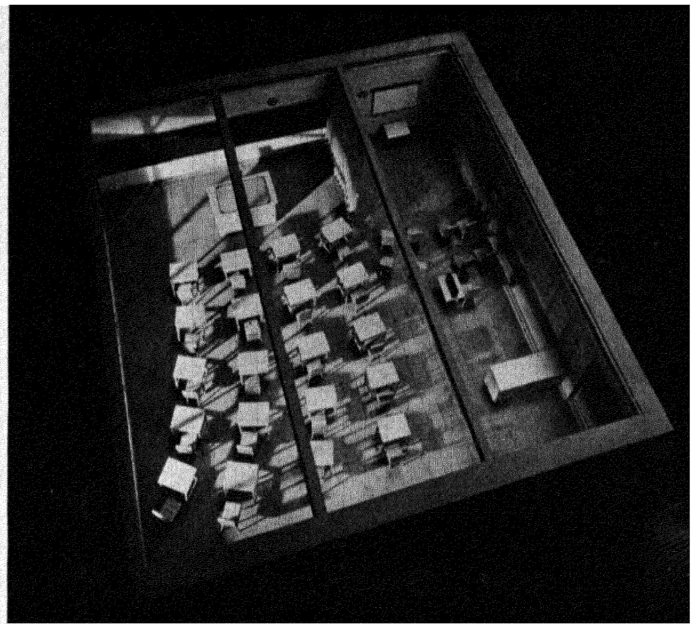
Gone are the days when the pupil sat rooted rigidly to a stationary seat behind a stationary desk, forced to learn by listening and prove it by echoing. Today's pupil learns by doing. He is active. And his active way of supervised learning demands informality and flexibility in the classroom. During one period of the day the classroom may be used for indoor play. During the next it may be used for spelling drill, followed by a rest period, followed by group projects in drama or creative art. This same classroom may be darkened for presentation of a moving picture. It may be turned into a miniature shop. Thus the classroom is flexible itself.

The classroom—and, indeed, all the other rooms in the building—can be planned for flexibility not only in type of use, but even in size and shape.

One way of achieving this flexibility in spaces is through the use of lightweight movable partitions. These movable and interchangeable units can be shifted from room to room with ordinary tools and very little labor. They can be used to divide a cafeteria or other relatively large space into two or more smaller spaces, or they can be removed to combine two or more adjoining rooms into one large room. They can be prefabricated of lightweight yet sturdy material, plasterless, demountable, and acoustically treated. And through their use it would be possible to clear an entire wing for major changes.

"All facilities of a school can be planned for extension, whether auditorium, lunchroom, shop, office, playfield, or classroom de-





There'll be some changes made . . . made every day in the classroom designed for flexibility. The same furniture can be used for formal instruction—lecture, recitation, study—or for group activity. Note also provision for movie and film-strip projection. Perkins & Will architects. Courtesy *See and Hear*.

The classroom becomes a resting room for tired tots at the Community School in St. Louis. Harris Armstrong architect. Pioget photo.

partments," says T. Norman Mansell.* "Such planning ahead should provide facilities which do not require expansion but which allow it to occur. Most of these possibilities can be realized at little or no cost over a comparable inflexible plan. A comparison makes them obviously preferable even at an increased initial cost since a substantial saving accrues to the taxpayer over a short period of time."

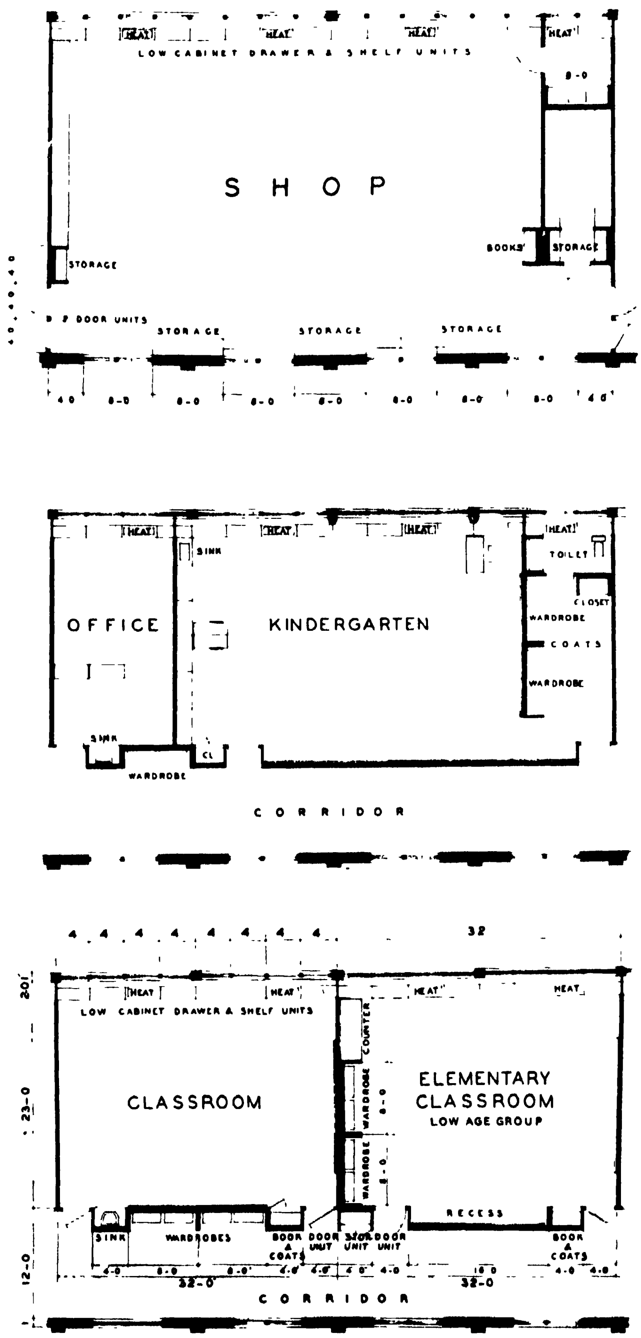
This flexibility cannot merely happen. It will not happen if it is thought of only after the building is dedicated. It must be planned for.

Changes in the school's functioning needs are sure to come. They should be foreseen as far as possible. But even unforeseen changes can be taken in stride if the building is planned as a dynamic, growing, functioning organism.

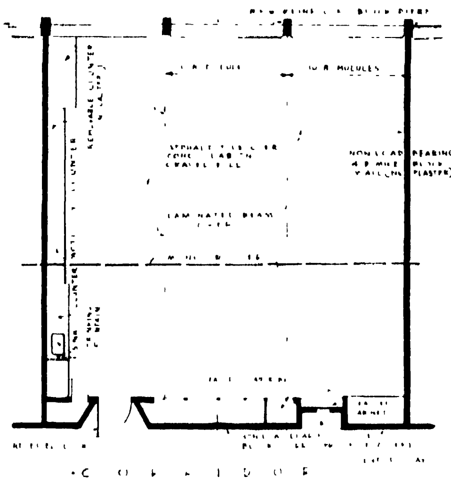
In planning for flexibility, it is well to consider some of the basic facts of life. A substantial part of the site should be level, if possible. The building should be skeleton-and-skin construction, without bearing walls. The end walls of instructional spaces may have to be altered, so they should be left free: free from load; free from mechanical and utility installations; free from important fenestration. Plumbing installations can inhibit flexibility if they are not planned for extension and inevitable change. Thus it is important that plumbing be grouped and placed so that it will not break up banks of instructional rooms.

The first half of the twentieth century has seen a startling increase in the manifold uses of electricity with attendant expensive alterations to provide proper wiring and controls. Many schools still operating were constructed when gas provided whatever artificial illumination was used. And thousands of schools which were constructed with a simple wiring system for insufficient incandescent lighting are handicapped in accommodating new electrical controls for heating and lighting, wiring for radio and audio-visual equipment, television, public address systems, inter-office communication, and the host of electrical appliances which are necessary to provide up-to-date instruction in homemaking. There is no reason to believe that this increase in the manifold uses of electricity will slacken. Therefore common sense dictates that conduit capacity should be based on a liberal, rather than a conservative, estimate of future needs.

Flexibility is planned into a classroom wing. Three good uses of the same space illustrate the advantages of modular construction for changing school needs. Courtesy *The American School and University*.



* *"Designing Educational Buildings for Tomorrow's Needs," American School & University, 1948-49.*



Flexibility through modular construction and walls that are not load-bearing. Edmonds Schools, Edmonds, Wash. William Arild Johnson & Harold W. Hall architects.

Grown-ups like to tinker—and learn. School shops should serve all ages. John Gass photo.

Where but in the school should Red Cross committee women plan community feeding? John Gass photo.

Heating services can be devised not only to serve individual rooms, but relatively small areas within those rooms, so that partition changes will not require major alterations in the heating system.

There are many good reasons for continuous fenestration, rather than grouping of windows for each room; one of the chief ones—aside from abundance of natural light —is the opportunity for flexibility.

Sometimes ingenuity can fairly dazzle in designing "built-in" appurtenances for working spaces and storage; but that same ingenuity can often dazzle brighter if cabinets, lockers, shelves, work benches and such are planned to be movable and interchangeable.

But a word of warning: Flexibility is a fine thing. However, as the National Council on Schoolhouse Construction says, "The plant needs of the current educational program are paramount planning considerations and should not be compromised seriously to achieve flexibility. It is better to have an instructional space correct for an operating program today, than to have it rate high in flexibility. Consummate planning often may achieve both objectives."

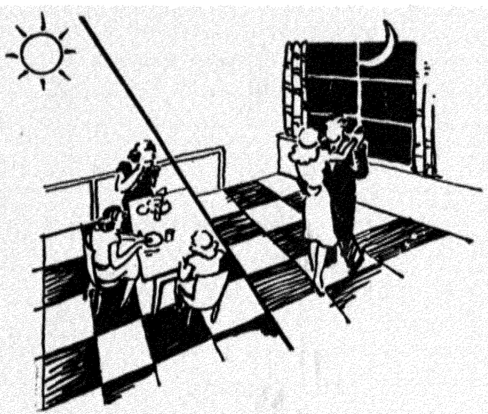
That is putting it rather mildly. It is an exceptional case that cannot benefit from the "consummate planning" which will provide for both flexibility and expansibility.

Multiple Use of Space

The flexibility discussed in the preceding paragraphs is the flexibility of change—the ability to alter the size and shape and character of a room.

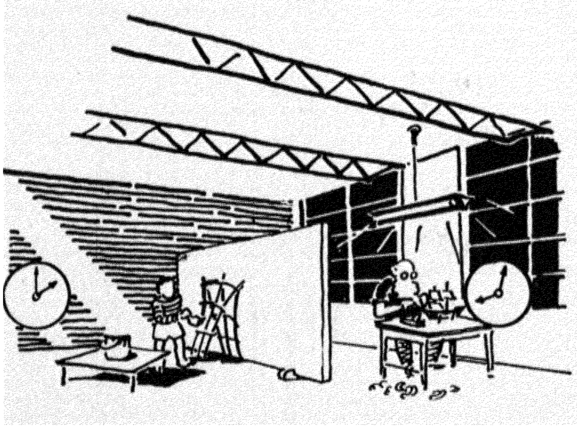
Another aspect of flexibility is "multiple use of space," which takes two forms. It may be space adapted to several kinds of subject matter—a classroom doubling for both science and history, or a cafeteria for study hall. Or it may be a room designed for use by community groups outside of school hours. Shop space may become a place for adults in the community to tinker with soldering irons, learn to upholster furniture, or try their skill at making shelves.

There are some general principles to be observed, particularly regarding the latter category. First of all, does the community want or need such facilities? Though unlikely, it may be that there are hobby workshops provided elsewhere in town, or halls where groups of people may meet, present plays, etc. If there are such facilities, and if they appear to be adequate for community needs, then planning for this facility in the school hardly seems necessary.



"The cafeteria can also be used for music rehearsal, dances, and dinner parties . . ."

"Our shops will be used all day by the school age groups and all evening by other groups."



Secondly, it is obviously wasteful to open the whole school on nights when the P.T.A. is meeting. Therefore a building, parts of which can be operable separately, is dictated, with toilets within the public part. Similarly, zoned heating and local unit ventilation are requisite so that parts of the building in use may be heated and ventilated while the rest is idle.

Let us take specific areas as examples and see how they may be adapted to multiple use.

The purpose of the cafeteria is to provide a large, cheerful space where students may eat quickly and conveniently. But the room is used for this purpose perhaps only two hours out of every day. Is this space to be entirely wasted the rest of the time? It need not be. It may be used during the day for study hall, chorus or band rehearsal, speech classes, visual projection, and at night for dinners, dances, etc. It thereby dictates provisions for darkening, storage space, and possibly a small stage.

Too often we find in the science department of a small high school separate laboratories for physics, chemistry, and biology, with additional lecture rooms. This is obviously wasteful since some facilities must be vacant many hours of the day. By careful planning the science suite could be adaptable to *all* sciences—not just one—as well as to lecture or study. A possible solution is a room with laboratory benches around the outside and space for class seating in the center.

The same factors apply to shops. They can be general, not specialized. They can provide many and varied facilities, with temporary partitions used to separate different activities. They should be easily accessible to the public and capable of being operated separately.

The study hall as a unit in itself is gradually changing in the educational program, for the reason that it may be bursting its bounds at one hour of the day, and practically empty the next. Library and study hall or cafeteria and study hall may be combined, and in some cases classrooms have been used successfully for this purpose.

The use of classrooms for varied purposes may be encouraged by the addition of cabinets, display space and possibly work space.

Multiple use may not necessarily be a virtue, however. The multiple use illustrated by a gymnasium-auditorium is the best known and most infrequently successful among the efforts toward multiple use. The very name itself implies conflict. Scenery cannot be built for the class play and left there because it might be demolished by flying

basketballs. Sometimes compromise is necessary, and a fairly good arrangement may be worked out. This is discussed fully under the section on auditoriums.

One-Story Structures

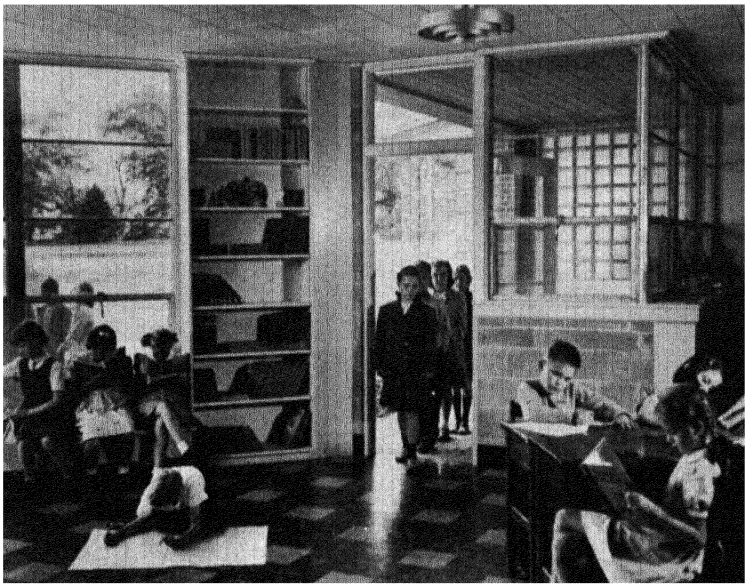
It is fairly obvious that the desired ends of flexibility, multiple use and expansibility can best be obtained when buildings are planned for one story in height. Sometimes this rubs the long hair of civic pride the wrong way, for there is a tendency in man to fear that which is larger than himself, and to translate that fear into reverence. Thus huge monuments.

But other reasons are presented in favor of the two- or three-story school building. Economy—the conservation of expensive land—is one. The economy of "Rock of Gibraltar" permanence is another, as if a building which looks big is necessarily permanent. On this point, James Marston Fitch's comment seems apropos: "Deeply ingrained prejudices in favor of maximum *permanence* in structure tend to obscure the fact that maximum *performance* is what we should demand in our buildings today."* A building may be built to last for fifty years or more, and be totally obsolete as to function in less than half that time. Yet its cost is amortized throughout its physical lifetime, not throughout its period of organic usefulness.

And there is strong doubt that the saving in land effected by the piling of classrooms on top of one another actually saves. It is demonstrably wasteful as far as efficiency of teaching, sanitation, circulation, and flexibility are concerned. And there is the high cost of that positive necessity—safety. Children can be evacuated from a one-story building in case of fire in only a few seconds—with no confusion, no panic, no danger. And one-story construction eliminates the expensive fire-proofing safeguards which should, and by law must, be built into multi-storied structures. Current minimum standards either do or should require:

1. Inside stairways enclosed, with fire doors at floor levels.
2. Enough fire escapes, easily accessible, protected from ice in winter, maintained against rust, kept in perfect working order.
3. Capacious halls, so large they are used only to their maximum in the event of panic, free from dead ends.

Each classroom provides easy access to the out-of-doors in this one-story elementary school near Wilmington, Del. Allen B. Stanhope architect. Willard Stewart photo.



Fitch, James Marston, "American Building," Houghton-Mifflin Co., 1948. P. 191.

4. Adequate fire walls and automatic fire doors sealing furnace or boiler room from the rest of the school.
5. Fireproof ventilating or air-conditioning ducts with cut-offs or dampers to confine smoke and heat.

And even when construction is supposedly fireproof, there is still equipment that is combustible. As one writer on the subject puts it: "Desks — and children — are not fireproof." The one-story school can be built for safety without the necessity of expensive so-called fireproof construction. The moderate cost of an automatic sprinkling system in the one-story school of non-fireproof construction runs far less than the expense of adequate protection for the multi-story school. And major authorities state that sprinklers can pay for themselves, in reduced insurance rates, in ten years or less.

Add the advantages of pleasanter, better-lighted rooms, plus greater convenience for the pupils, and the sum of arguments in favor of the one-story school totals large.

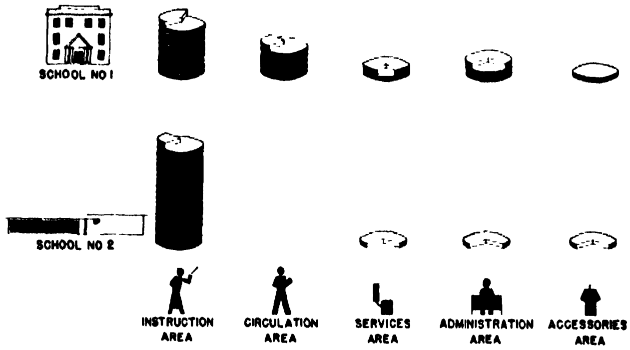
The community is investing in space . . . protected space engineered for learning.

Caudill defines the main elements of that space—particularly in the elementary school—as:

1. Instruction—including classrooms, auditorium, gymnasium, library, workshop, and other rooms where students are actually taught.
2. Administration — including space for principal, secretary, faculty lounge, health clinic.
3. Circulation — including corridors, lobbies, and stairs.
4. Services—including toilets, cafeterias, kitchen, lockers, janitor, and space for other service equipment.
5. Accessories—including storage, heating units.

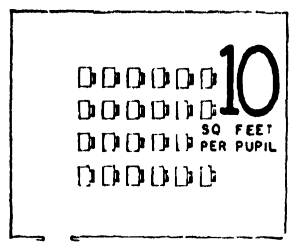
One of the most important questions that can be asked about a school plan is: How much of the school dollar is being invested in the space that means the most—*instruction* space?

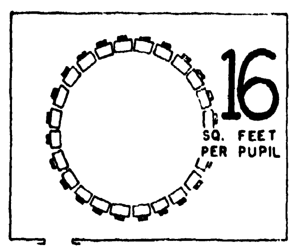
Here again is an opportunity for comparison between the multi-story school and the one-story school, built with its spaces related according to plan.



The one-story school answers: "Into instructional space, most of it!"

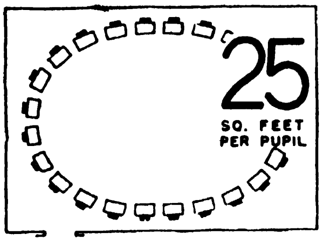
The formal desk and chair arrangement. Closed circular arrangement. Open arrangement. Chairs in rows. Table grouping. Chair circular arrangement. Circular chair arrangement of small groups. Space for sleeping. *Space for Teaching* by W. W. Caudill.

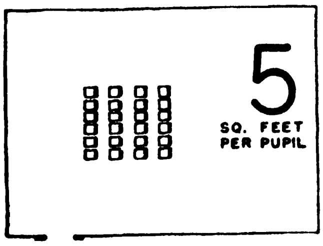


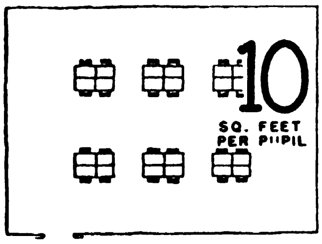


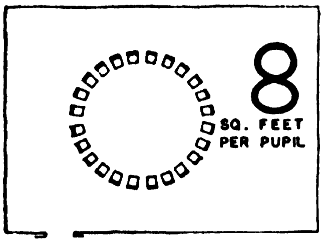
Amount of Space

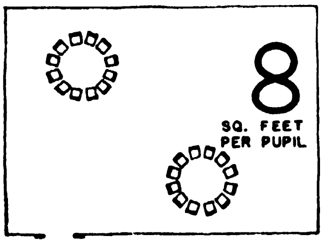
We have seen how the pupil's needs for recreation room have been recognized and are being met. So also are educators and architects realizing that the instructional area per pupil cannot be computed on old standards. The formal fixed-seat-and-desk ar-

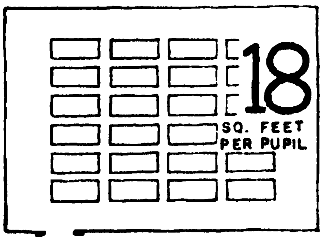












rangement could theoretically accommodate one pupil in every 10 square feet. But that is not good enough for today's standards.

Caudill makes a strong case for allotting a minimum of 35 square feet of floor space per pupil.* Note the variety of classroom arrangements which may be used even when the youngsters are reciting, or listening to a story-telling session. In order to achieve necessary freedom for these various furniture groupings at least 25 square feet per pupil must be provided. However, those kids do not sit in their seats all day long. Not any more. They are busy doing things, learning not by rote but by participation. They may build a house, put up an Indian teepee, operate a grocery store or a bank, plan a model city, produce a play. And for these projects in which they learn by doing they need room, lots of room, so much that the figure of 35 square feet per pupil—not including toilets and workshops adjoining the classroom—seems conservative.

The *amount* of space devoted to instruction is important. Just as important is the way that space is used—its relationship to the other space functions of the school. The break-away from the square box type of school building has amounted to an unfettering—a new freedom that allows the school to be planned by its activities, by the job it is to do.

So planning starts with the classroom. In ye olden days the building might have come first, the grand and glorious edifice which could be pointed to with pride; and into this structure were fitted the classrooms, falling as chips where they might. Now, fortunately, the building evolves from the classroom, or from a series of classrooms, each designed specifically for its specific jobs. Today's thinking goes even further—all spaces are regarded as learning areas and are designed to stimulate such learning: the corridors, for example, and the cafeteria provide valuable social lessons. But essentially the modern school is built from the classroom up. And for good reason: The classroom engages most of the pupil's time.

Interrelationships

Thus the classroom should receive first consideration in orientation for favorable sun and breezes. It should be located in relation to other space areas so that there will be a minimum of noise distraction. And if it is

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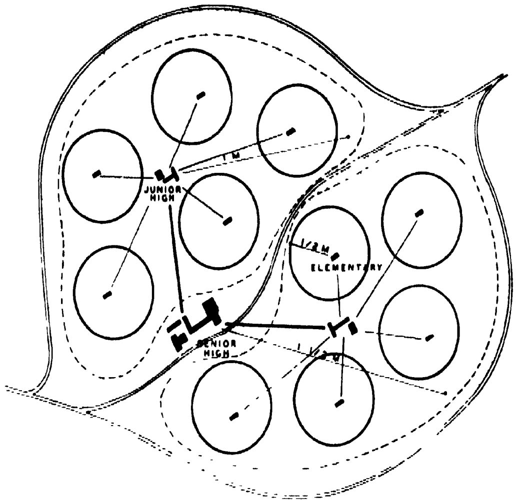
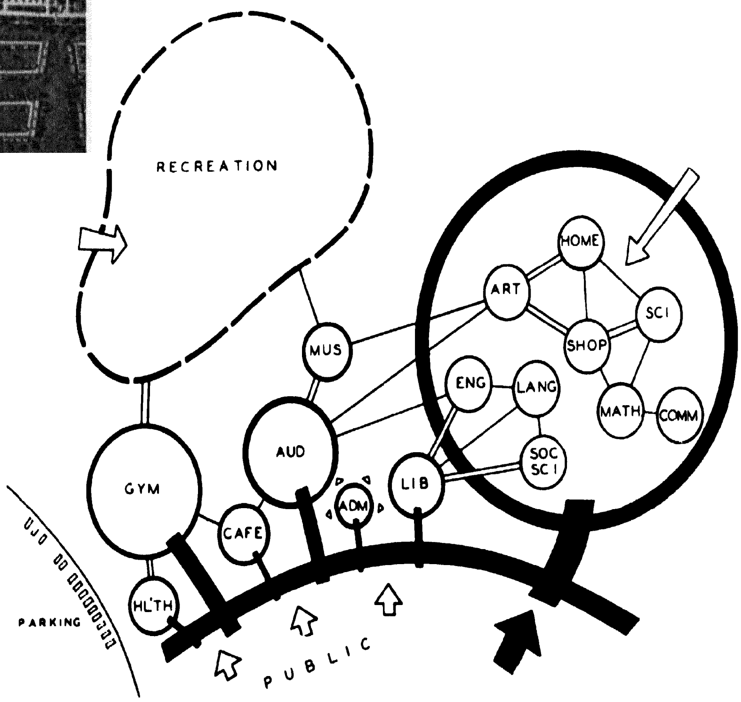
* *Caudill, William Wayne, "Space for Teaching," Bulletin of the Agricultural and Mechanical College of Texas, August 1, 1941. P. 54.*



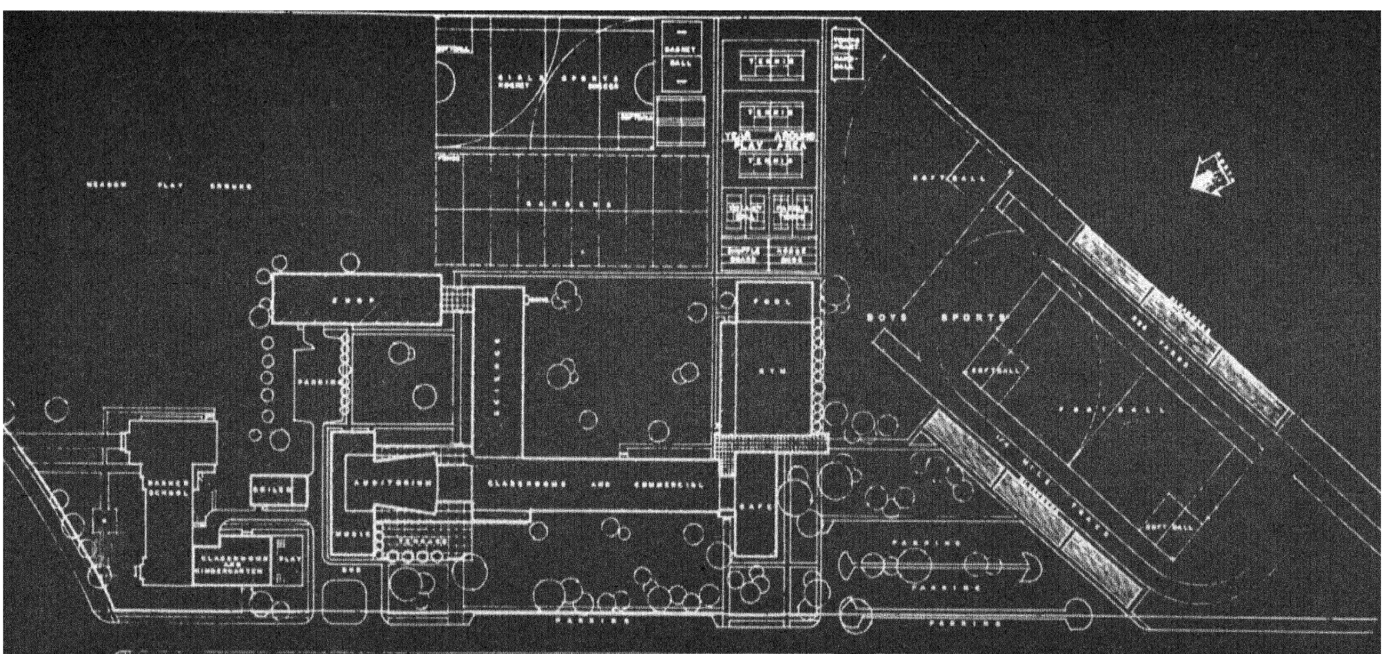
Relationship and distribution of an elementary school, junior high school and senior high school within a city.

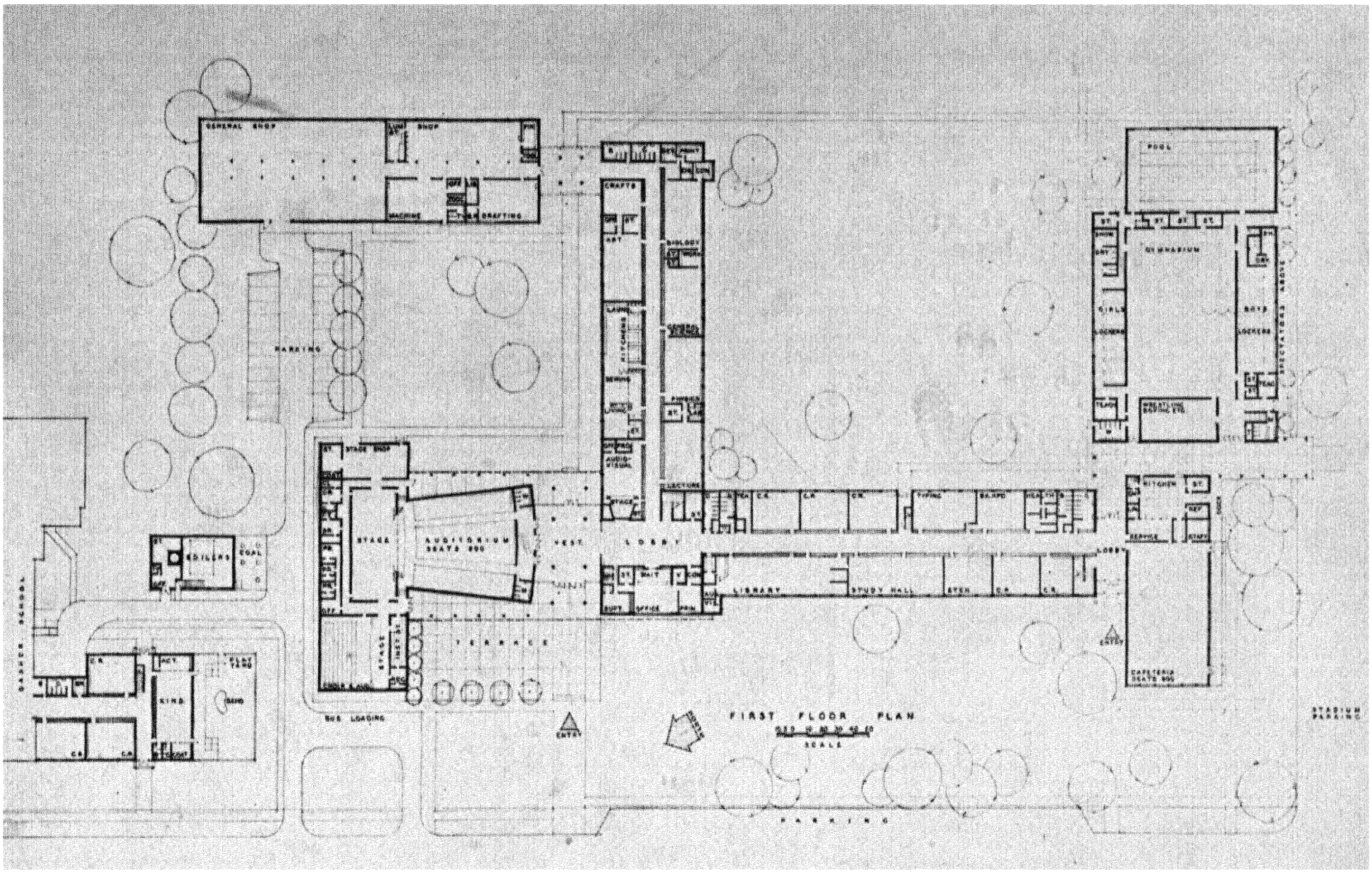
1 A hypothetical model of the distribution of schools in a city area.

Sketches and drawings by Eberle M. Smith Associates Courtesy *School Executive* January 1949.



2 At right: Diagrammatic form showing relationship of the units within the school to each other and to the site. Below: An actual example of departments within a building site.





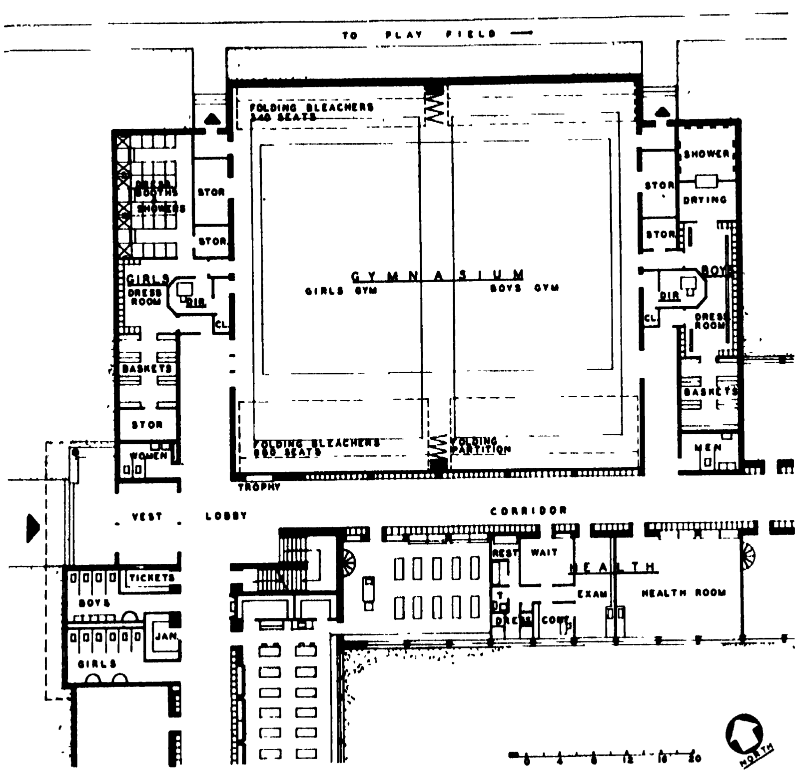
3 Relationships need study. Eberle M. Smith of Detroit, Mich. suggests following the six sets of relationships shown on these and following pages. Courtesy *The School Executive*, January 1948.

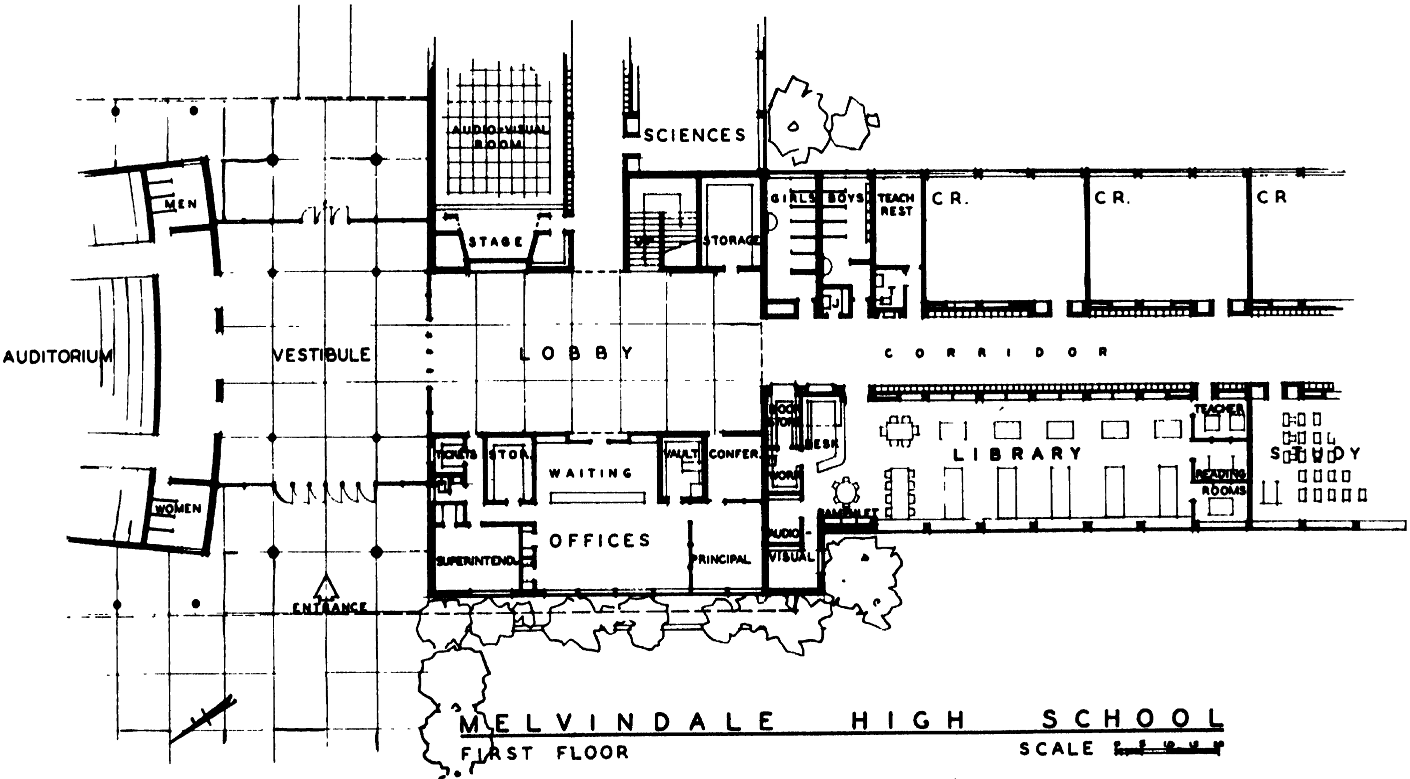
a noisemaking room—such as a metal-working shop or a music room—it should be isolated or insulated so that it will not be guilty of distracting others. It should be connected some way or other with the recreation unit, the assembly unit, the administrative unit, the dining unit, and other service units. This is done usually by corridors, either enclosed or open; in many schools these corridors are lockable so that when the public units of the school are used after hours the classrooms are safe from invasions by the curious, idle, or predatory.

It is usually sensible to group playroom or gymnasium next to playfield and close to the dining space, since students often like to shake down a lunch with activity. It is also generally acceptable to group assembly rooms and administrative offices adjacent to eating and playing spaces, since these are the units used most by the public. Experience has shown that administrative offices should adjoin the main corridor, or be otherwise centrally located, for ease in supervision. And many schools have demonstrated the advisability of complete separation of age-groups, with the kindergarten and perhaps the first two grades isolated, accessible by their own separate entrances and enjoying their own play spaces.

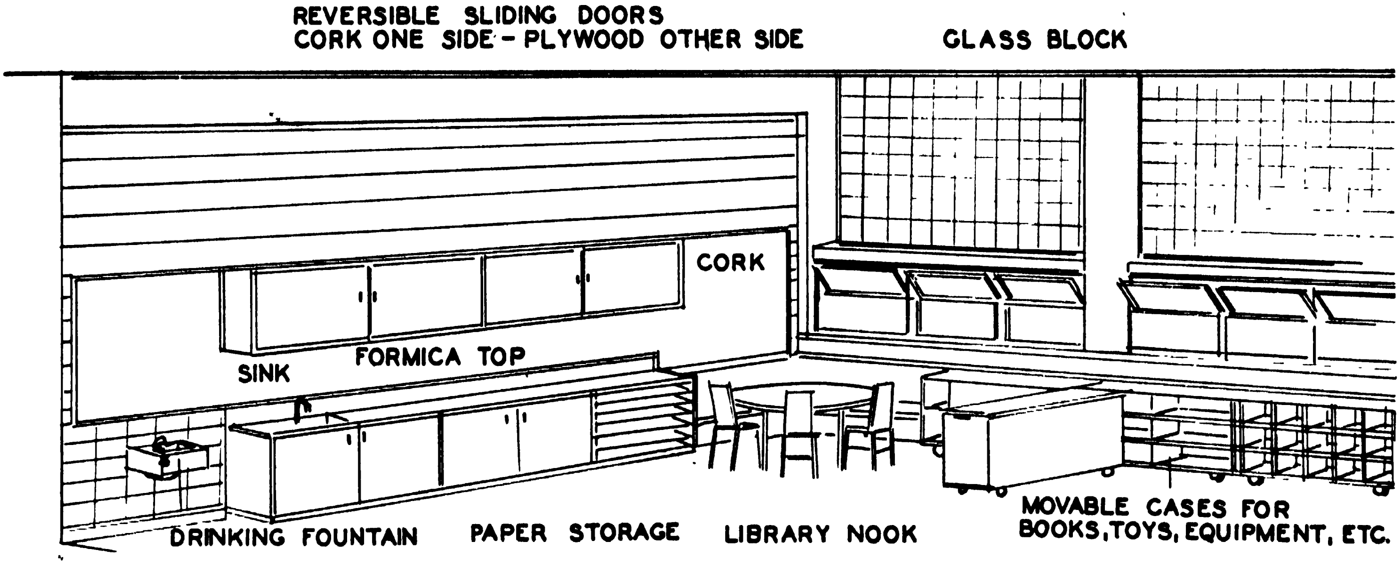
4

This high school gymnasium and health unit is readily accessible to pupils and at the same time can serve the community well.

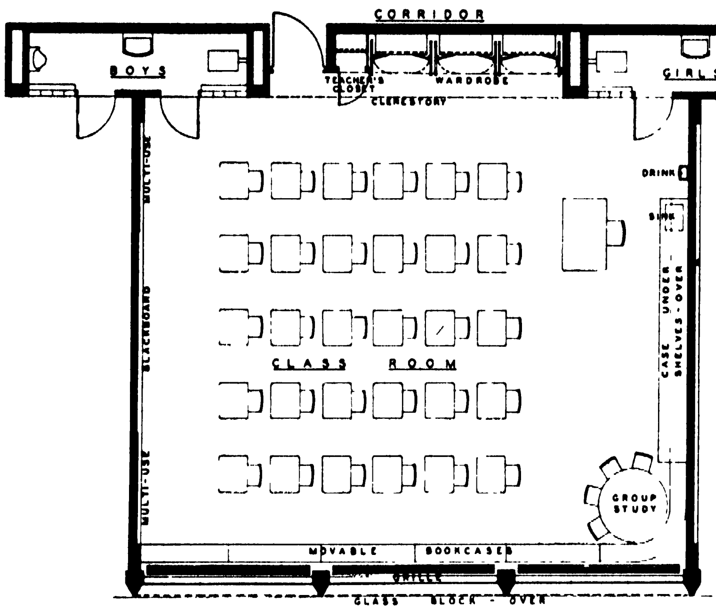




Library offices and auditorium are all in close proximity to the center lobby and provide proper relationship of these spaces.



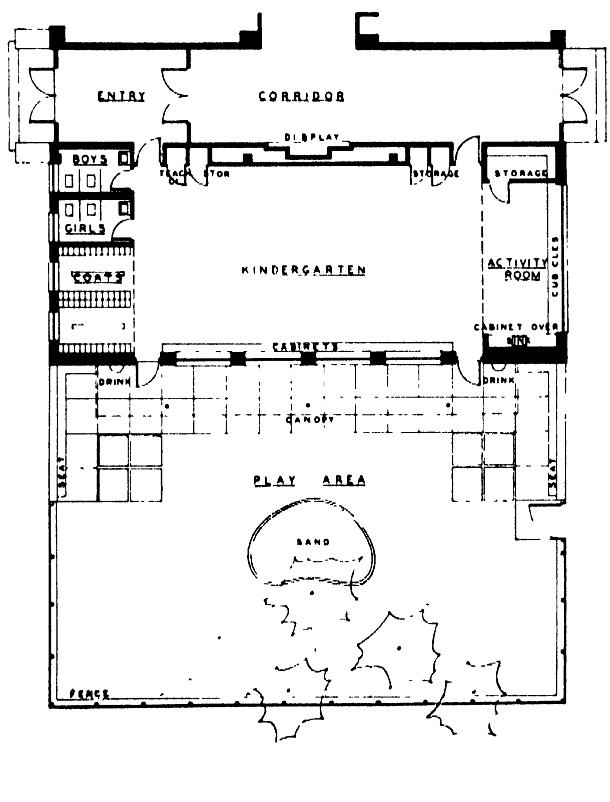
A classroom showing arrangement for group activity. Bookcases are mounted on wheels. Cases can be stored either along outside wall or grouped in room



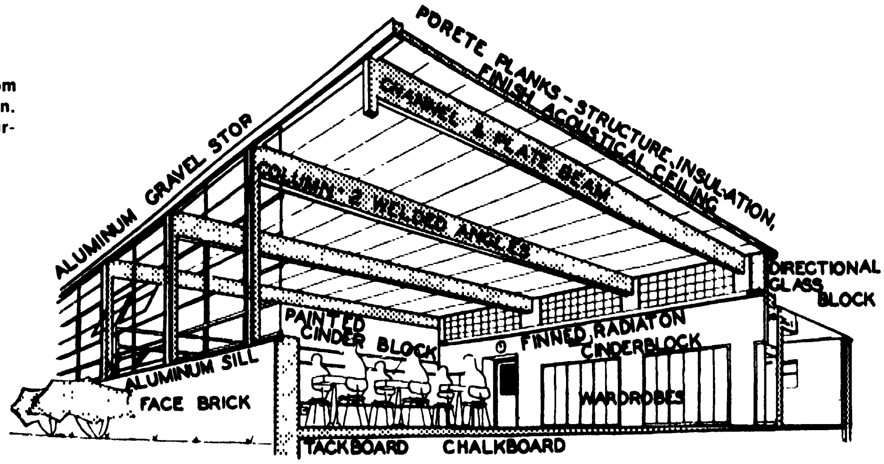
A typical classroom showing space relationship within it.

5

This kindergarten unit has an isolated play room, toilet facilities, wardrobes, and activity spaces.



Bilaterally-lighted classroom with simplified construction. Eberle Smith Associates architects.



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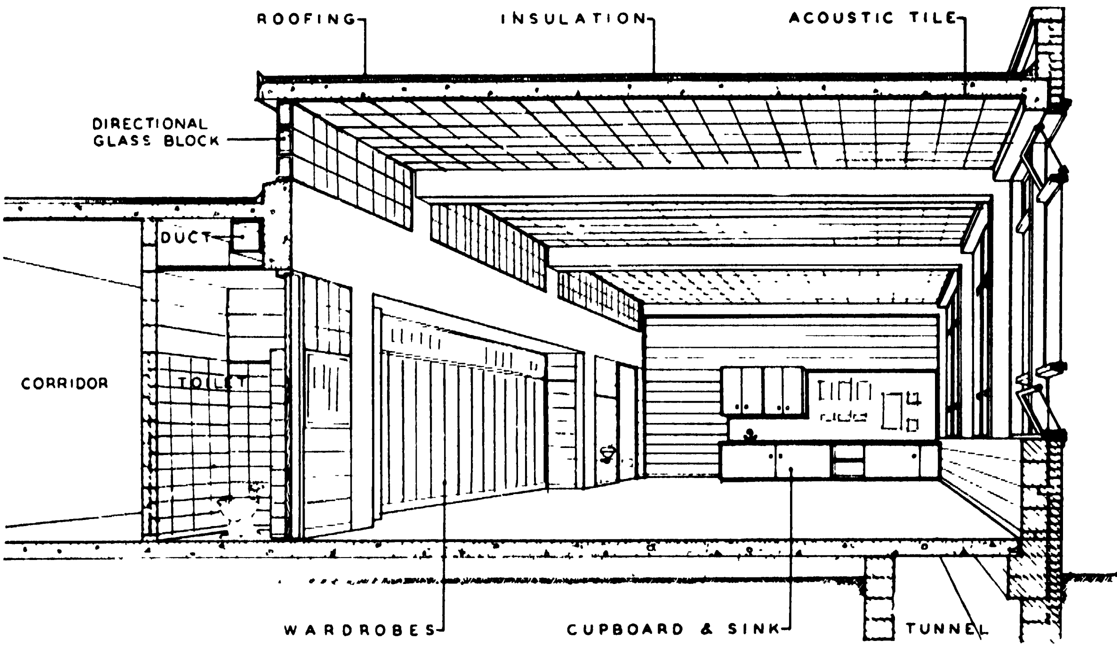
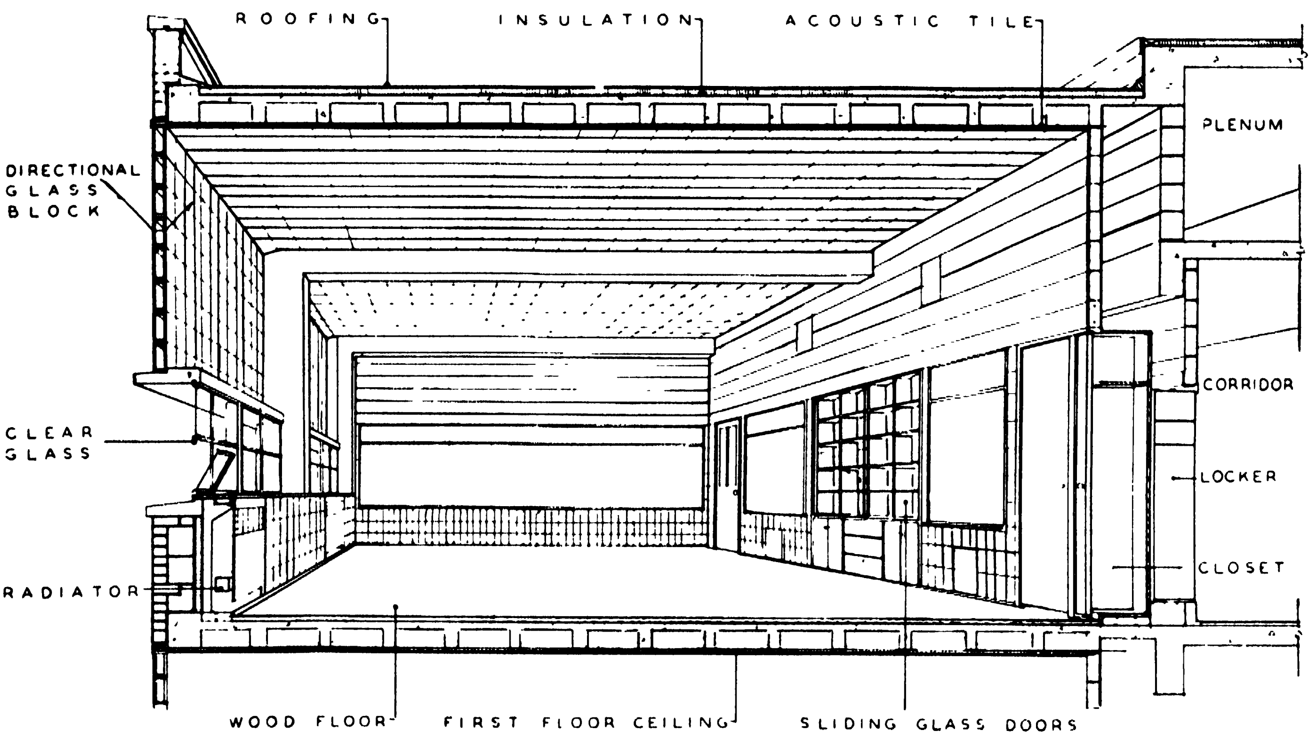
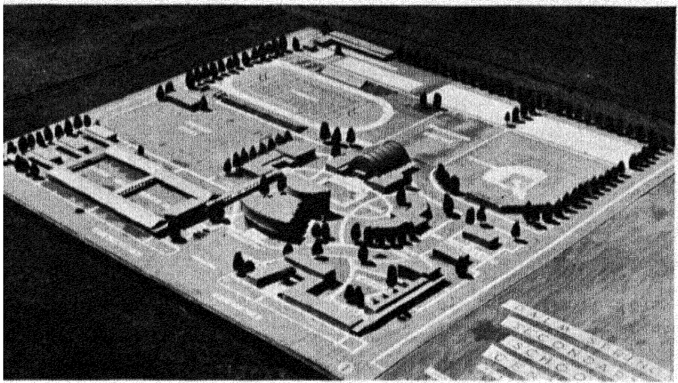
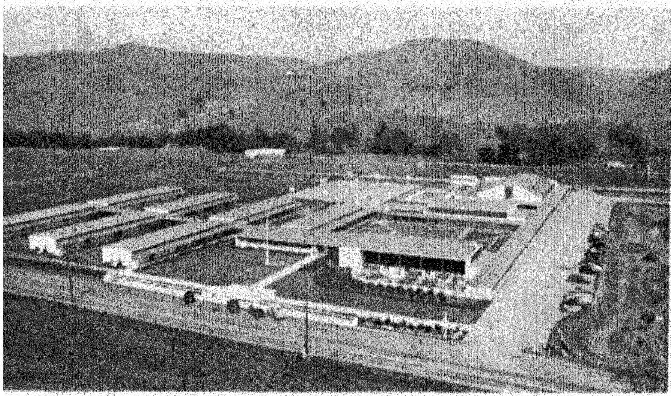


Unilateral two-story classroom. Below: Bilaterally-lighted classroom.



Clay model of Palm Springs, Cal. secondary school center shows intelligent design separating academic activities of junior high school, high school and junior college, yet binding the whole together at core of universal group use—auditorium, swimming pool, gymnasium. Harry J. Williams architect, Stewart & Roger Williams associates. Gayle's photo.





Separate but connected wings provide trouping of related activities in Acalanes Union High School, Lafayette, Cal. Ernest Kump architect.

Recognition of the various functions and services within the school—even the varying needs and uses of classrooms—has led to complete decentralization in which units are housed separately. This has been called the campus plan, and it has its points, both good and bad.

On the credit side of the ledger, it may be said that instructional spaces abound in greater freedom and flexibility. They can be blessed with ideal orientation, adjoining outdoor classroom space, isolation from noise.

It is possible, however, to reach a compromise; and its possibilities in terms of improved education are extolled by Caudill as follows: "A number of smaller buildings, each accommodating a group of children on the same maturity stage, gives richer possibilities for children to plan and carry out programs for which they are responsible. One central building provides for common needs arising in the school community, such as assembly, cafeteria, administration, health and guidance services. The smaller buildings are self-contained, with such advantages as washrooms, display spaces, activity rooms, workrooms and group rooms in each separate unit. The decentralized plan expressed in a number of separate buildings makes a community school possible. The emphasis is on community living rather than on institutional living, which has heretofore characterized much of school planning."*

Now the question is sometimes raised: "Doesn't this sprawling of the plant over the site conflict with beauty because it lacks balance and symmetry?" The answer to that one is that "esthetic balance" is a term for the textbooks; the true beauty of any building depends on how closely its form follows its function. For actual symmetry the World War II aircraft carrier would have been built with the "island" in the perfect middle of the flight deck, rather than to one side. As Mies Van der Rohe has said, "Essentially our task is to free the practice of building from the control of esthetic speculators and restore it to what it should exclusively be: building."

But nearly a century before, that crusty old Yankee, Horatio Greenough, had said: "Here is my theory of structure: a scientific arrangement of spaces and forms adapted to functions and to site; an emphasis of features proportioned to their *gradated* importance in function; colour and ornament to be decided and arranged and varied by strictly organic laws, having a distinct reason for each deci-

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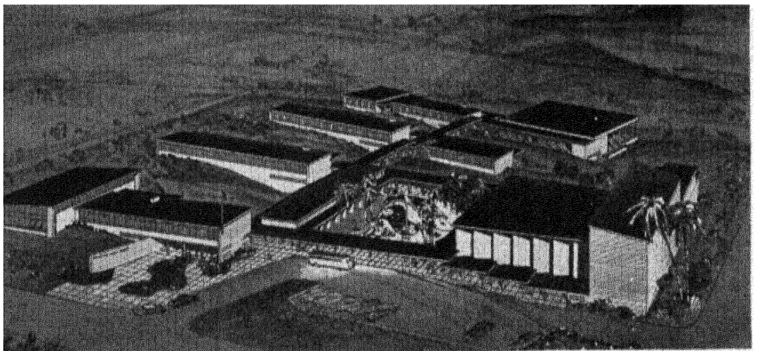
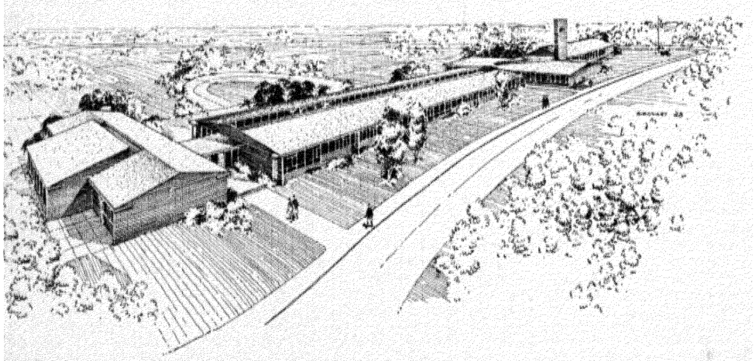
* *Ibid. pp. 58, 60, 61, 62.*

Community-used spaces are handy to the entrance and parking area. Other grouping gives light and air and insulation for related activities. L. Alex architect, Perkins & Will architects, engineers, consultants. Hedrich-Blessing photo.





Kindergartens, classrooms, then large group spaces—each in its own building, yet all in one building. Perkins & Will architects. Hedrich-Blessing photo.

sion; the entire and immediate banishment of all make-believe."*

Then let us consider that vitally important member of the school community—the teacher. The success of the teacher's job—and the teacher's interest in that job—are affected by the facilities provided. The worker in industry has proved the value of this in dollars and cents. Will anyone deny that the school product is more important?

> *"In logistics, the school plant looms large as a problem. The day is gone when the school building can be planned by an architect and a school committee working in terms of their traditional concepts of a schoolhouse. A new type of schoolhouse is slowly evolving. Its size, the character of its spaces, the relationship to its setting are all being affected by the community's ideas of what the education program must be. Communities must learn to discard the obsolete school plant and develop that which most assuredly advances all the educational interests of their people."* †

Remember—the building is not an end in itself; it is a tool, an instrument.

This instrument—this tool for education and community service — performs many jobs. These jobs are interrelated, and these relationships must be expressed eventually in terms of physical plan. There is the relationship of buildings to the community as a whole; the relationship of elementary to junior high school to senior high school numerically, educationally and geographically. Each must be conveniently located relative to the feasible travel of the students of each age group. There is the relationship of the school building to the site; esthetically related in the sense of appearance; educationally related to setting, traffic and to the recreation and auxiliary functions of the site itself. There is the relationship within the school of its various departments, expressed by physical proximity. The cafeteria can be near an auditorium or gymnasium to provide overflow or auxiliary space, as will be outlined further on.

We are particularly indebted to Eberle M. Smith for his diagrams illustrating these particular relationships. These express graphically the thought that while everything should be convenient to everything else, there are priorities, and some things should be more closely interrelated than others since everything cannot be next to everything else.

From the standpoint of physical plant and planning, these relationships are not only

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* *Wright, F. L. "When Democracy Builds."*

† *Engelhardt, N. L. "The Logistics of the Public School System." AMERICAN SCHOOL AND UNIVERSITY, 1944. P. 398.*

within the rooms themselves and with the limitations of structure and with the space in each department, but they are between categories of space which broadly partition the educational plant. These may be sorted into five different categories of learning and development:

Classroom and Auxiliary Spaces
Large Group Spaces
Shops and Laboratories
Health and Physical Education
Building Services

Each is important in its relation to the others, in its relation to the needs of each student, in its reflection to the needs of the community. The question to answer in the planning is: Which is to be emphasized the most?

The expression of education in terms of physical plant may be, for example, a room where reading and history and social studies are taught; or a library; or a guidance room. It may even be a part of the administration element of the school, to the extent that there are counsel and curriculum guidance carried on in these offices.

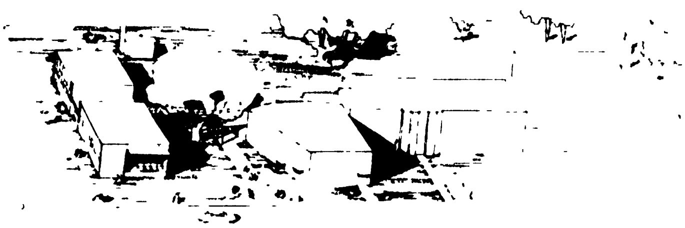
Education is also emphasized in rooms especially fitted out as laboratories, shops, arts and crafts studios; and in some areas barns, poultry houses, and other means for teaching a greater understanding of the land and the living it produces.

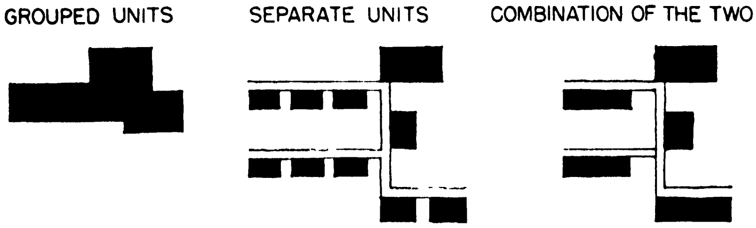
Physical education to some people means calisthenics and, in terms of physical plant, a place for them. It is a far broader subject requiring, as the planning may demand, a great variety of spaces and equipment. It can include space for health instruction; medical and dental clinics; in addition to exercises and games which may take place anywhere from the kindergarten with movable furniture on to playsheds, paved play areas, gymnasiums and elaborate playfields.

Again, education deals with the relationships of students with each other, and building provisions should be provided for places devoted chiefly to group experiences. In a sense the corridor is (for good or bad) a socializing instrument, where compromise and cooperation are rewarded and non-conformists get bruised. A much better example in this category is the auditorium, where the audience's reaction on itself is just as important a developing experience as the information or cultural uplift, if any, which emanates from the stage. The cafeteria, too, serves a social function.

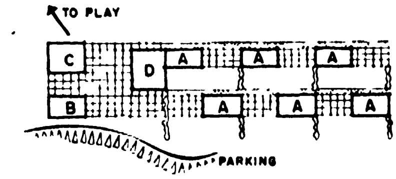
Obviously, these functions overlap. The boy working at a lathe is no hermit; he is undergoing social development in his cooperative

Additions to an existing school ingeniously separate from and adjoining the auditorium, playroom and lunchroom. Becker Elementary School, Austin, Tex. Arthur Fehr & Charles Granger architects.





A few of the infinite numbers of ways of arranging the main elements of space in the elementary school.

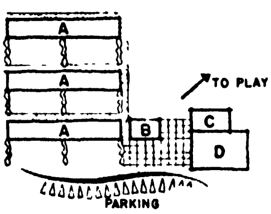


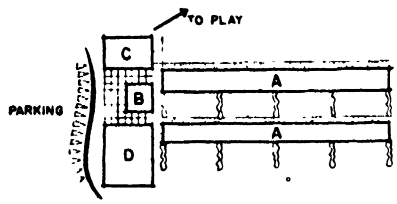
A CLASSROOM UNIT

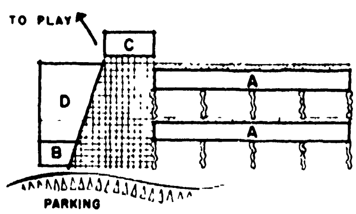
B ADMINISTRATION UNIT

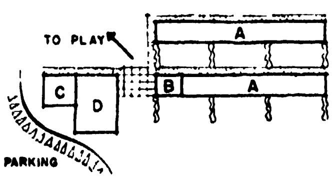
C RECREATION UNIT

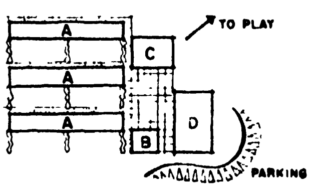
D ASSEMBLY UNIT

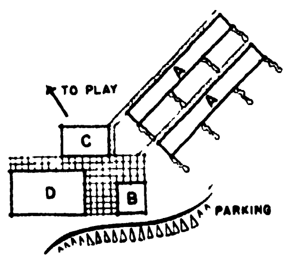






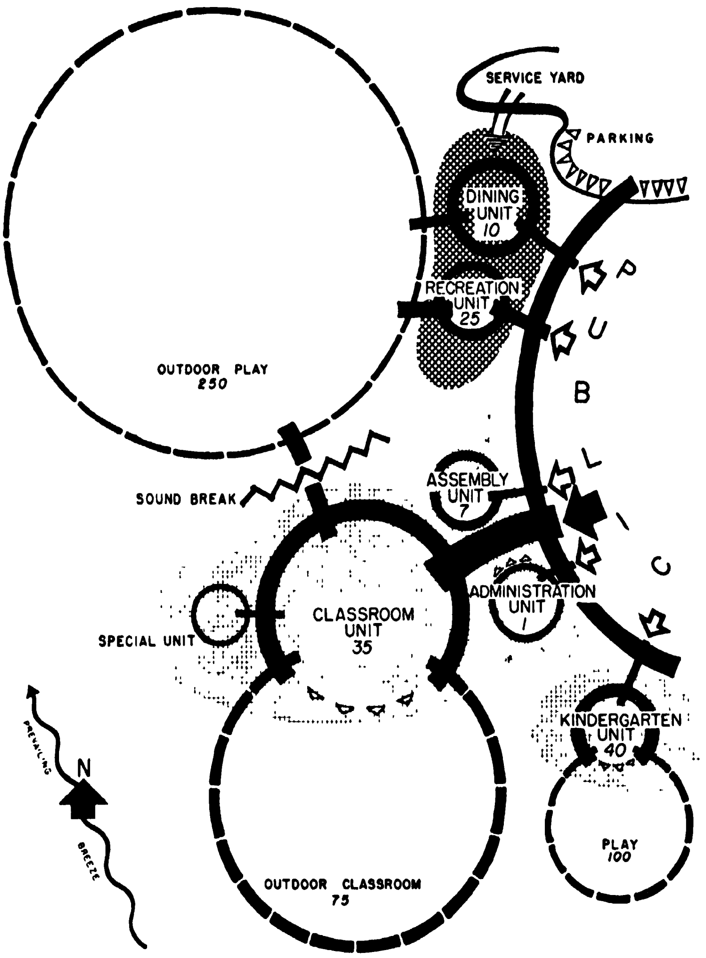






SPACE RELATION CHART

CONDITIONS → / ELEMENTS ↓	● SHOULD HAVE A PUBLIC ENTRANCE	● SHOULD HAVE OUTDOOR EXITS.	● SHOULD BE NEAR A PARKING LOT.	● SHOULD BE CONNECTED TO OTHER ELEMENTS BY IN-DOOR OR OUTDOOR CORRIDORS	● SHOULD HAVE A SERVICE ENTRANCE.	● SHOULD HAVE PREFERENCE TO THE BEST EXPOSURE.	● SHOULD BE IN A QUIET ZONE.	● SHOULD BE IN A MODERATELY QUIET ZONE.	● SHOULD BE IN A NOISY ZONE.	● SHOULD HAVE DIRECT ACCESS TO THE MAIN PLAYGROUND	● SHOULD BE LOCATED WHERE IT CAN BE EASILY RECOG-NIZED BY VISITORS.	● SHOULD BE AN ISOLATED UNIT.
● CLASSROOM UNIT		✓		✓		✓	✓					
● ADMINISTRATION UNIT	✓		✓	✓				✓			✓	
● RECREATION UNIT	✓	✓	✓	✓					✓	✓	✓	
● ASSEMBLY UNIT	✓	✓	✓	✓	✓			✓			✓	
● DINING UNIT		✓		✓	✓				✓	✓	✓	
● KINDERGARTEN UNIT		✓				✓	✓	✓				✓
● SPECIAL UNITS				✓	✓	✓	✓					



QUIET ZONE

MODERATE ZONE

LOUD ZONE

NUMBERS REPRESENT AREA PER PUPIL

This chart and diagram show the interrelations of the seven main elements of space of the elementary school. They may be used to check architects' preliminary sketches. Top, opposite page: These elements may be composed in three ways: first, by putting all of them under one roof; second, by putting each under a separate roof; and third, by having a combination of the two. Bottom, opposite page: Here are only a few of the infinite numbers of ways of arranging the main elements of space of the elementary school.

labors with his classmates; learning knowledge as his work is brought to conform to assignments from text. The library and the hockey field contribute to social experience fully as much as they do to eyestrain and charley horses.

But this rough classification of functions, even though they may overlap, is introduced to help in forming a basis for emphasis. Which of these functions in the school you are going to plan will be stressed? How much of each will you provide?

Suppose you were planning a school for an almost aboriginal community, where the level of living has trouble keeping up with the level of subsistence. Would you emphasize knowledge, and build a set of classrooms? The chances are you would emphasize how to make a living, and build a school that would help teach how to put ten more pounds of meat on each indigenous pig in hope that the natives might live long enough and well enough to be able to enjoy the amenities of arithmetic and reading. Your school might very well resemble a well run farm, and to be truly valuable, it would be built in such a way that the buildings themselves would be instruments of education, setting an attainable standard which might influence personal standards of living shelter. Here the "philosophy of education" would choose an all-out emphasis on technical education as a prerequisite to physical education and health which in turn are prerequisites to metaphysics and good manners.

On the other hand, a school system in a wealthy community, where subsistence is taken for granted, and where the social graces and adequate health are assumed along with the inevitable college education, may still make feasible some emphasis on technical skills. Why? Why should the incipient Harvard or Smith candidate learn to work with the hands? Because such technical education may bring an awareness of the sources of wealth and production and the problems and achievements of those who till the acres and tend the machines for a living. And for the distaff side, it may teach what a distaff is, point up the creative opportunity in the home arts which can lift cooking, sewing, and running the vacuum cleaner above the level of unpleasant routine.

There can be overemphasis, too. Watch out for it, if a balanced school plant is intended to serve its community's needs. Someone once said that the average school in Indiana was planned around a basketball court, and that classrooms were added if the budget permitted. That of course is a vile canard, but it may illustrate the point.

Along with these educational functions of the school go two others that require space—administration and service. Administration must, of course, enter into all the other functions to keep the plant running efficiently. And service, while not an instrument for learning, is a necessity. Children may have to be transported, which means busses and space for parking and maintenance; they may have to be fed, which means space for cooking and eating; and the school must be kept warm and ventilated and clean.

So here, then, are the functions of the tool. It is up to the planners to determine which function should receive how much emphasis. Thinking within this framework may help to make a decision between a large cafeteria or two more classrooms; a small gymnasium and two shops or a large gymnasium and one shop; more seats in the gymnasium or more seats in the auditorium.

You pays your money and you takes your choice.

CHAPTER 3: Classrooms and Related Spaces

In any concept of a schoolhouse, classrooms occupy center stage. To none are they frills or fads. We all sat in them. Schools always have them. Almost as widely accepted is the idea that schools must have some sort of a library, books being pretty central in almost every educational philosophy. And, of course, there has to be some sort of place for the principal—an office, and some kind of room for teachers. Everyone knows that. That does not take a committee.

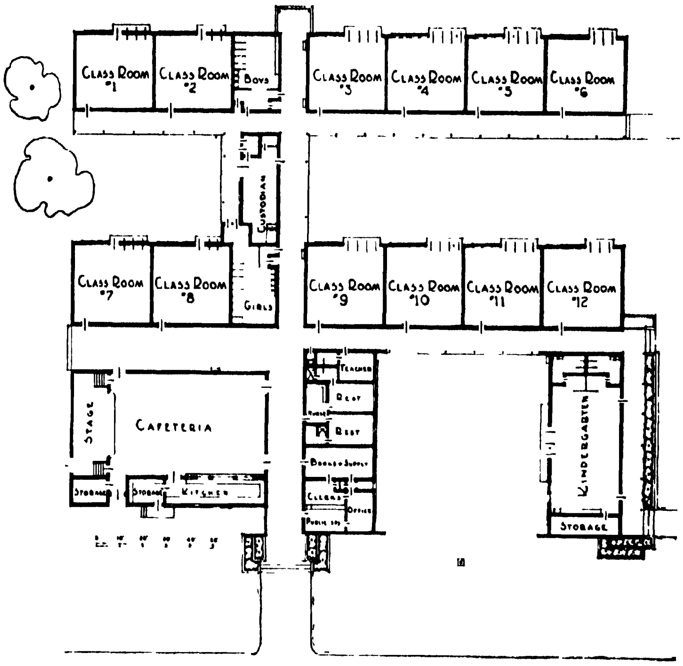
But what about that basic space unit—the classroom? How large should it be? How warm? How much window space should it have? How should it be heated, ventilated? What equipment—what tools—will it have to do its job?

These are not new questions. They have all been answered before. In fact standards have been frozen into law, or into regulations almost as solid as law. Those standards need thawing out. New technological materials and know-how have outmoded some of them. Some of them are based on "facts" which we know now are not facts at all. All of them are based on particular philosophies of education—although probably not consciously. Most of them are minimum standards, which have become maximum achievements. They were designed to protect safety and health; to protect school districts against ignorance and false economy of school boards, administrators, voters; against inexperience, error, even against corrupt practice, of architect and builder. All of them are old with the venerability of old age and its inappropriateness in a changing technology and educational program.

A single illustration of technological senility: window heads should be half as high as the room is wide (and ceilings higher!). We know this does not give the good lighting it seeks. Two minutes with a light meter on the inner row of seats will show that.

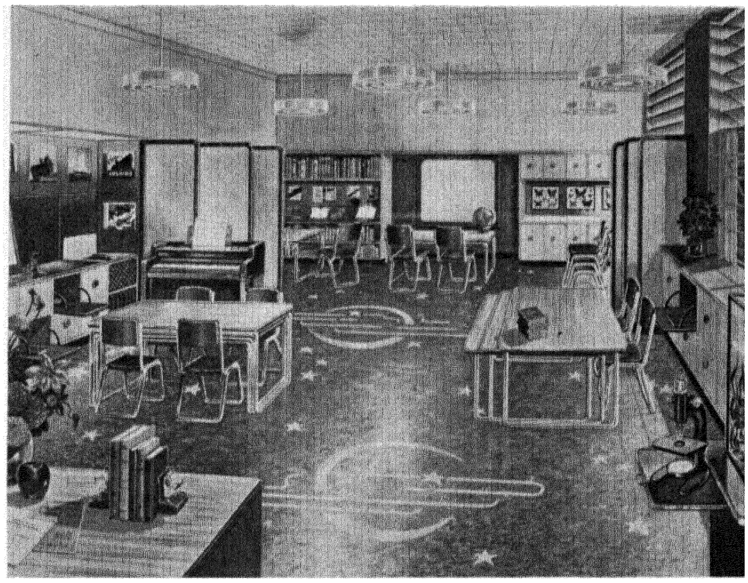
Another educational obsoleteness: windows should be in a row at "left" of class only. Do all children sit in rigid rows facing in one direction in today's classrooms? And let's not ask the inconvenient question about what the poor child who is unforgivably left-handed must do.

The classroom is the center of school house planning. Charles H. Biggar and C. B. Alford with W. J. Thomas associated architects.



Model at left shows typical old-style classroom unit. No wonder inmates thought it resembled jail! Contrast with freedom and light of modern classroom, right, design of Perkins & Will architects. Courtesy *See and Hear.*

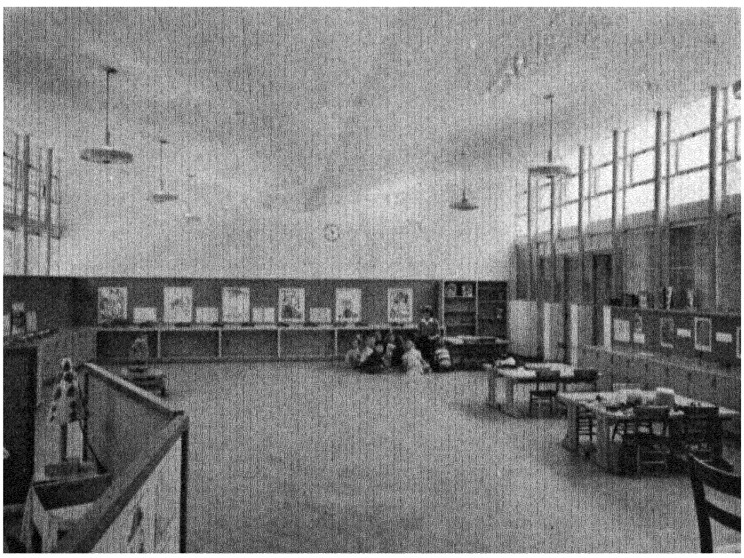
But standards are good—if they are standards of conditions to be provided. Good seeing conditions — good hearing — pleasantly fresh air, odorless and comfortably warm—safe and healthful conditions. Yes, these are standards to be sought. There is design and technological know-how around to produce them. There are men, and should be more, in state departments to evaluate design for these conditions. Boards of education and superintendents do not have to know all the answers, nor need they rely on some ex cathedra "standards" for assurance of safety and health in the classroom.



The space that fits today's classroom program may look very different from yesteryear's. Courtesy of Armstrong Cork Co.

The design for best use of materials and best physical conditions is not enough. Far from it. Things are going to happen in this classroom. Shall the architect guess what they will be? Shall it be his job to crystal-gaze? Or, worse, shall his hasty guess of today shape these things for years to come? Absurd. Here is the place for educational planning. Here is where the educational philosophy of today, designed by school and community folks—with some shrewd guesses as to trends and possible change in the next couple or three decades—comes to the rescue. When the philosophy is determined, for now at least, then the teachers, custodians, supervisors—the whole school staff really rolls up sleeves and gets down to work. They get down on paper—even maybe do a little picturing—what kinds of activity are going to express the accepted educational philosophy. This cannot be done once for all school districts. It has to be done over and over for each situation. Does this philosophy emphasize listening? The read-and-recite activity? Will children work in groups at noisy activity? Will they march to a gymnasium for "Physical Education"—or to an art room for "Art"? Will they live pretty much entirely in the classroom? And so it goes. The answers to these and many, many more questions of the sort are terrifically important to the design of the classroom. Back when we talked about the information needed to plan a school building, we touched this lightly. Now we see how vital it is.

A kindergarten in La Canada School, Cal. H. L. Gogarty architect.

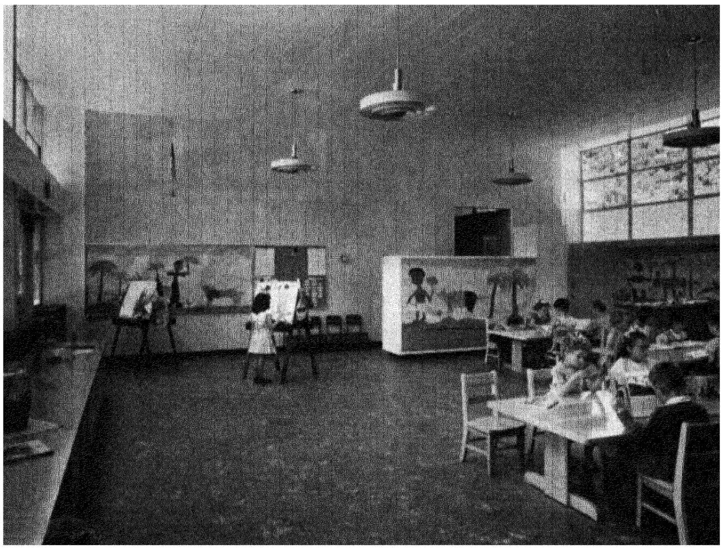


There may be some who dispute that what goes on inside a classroom matters so deeply to design. But who will dispute that the room itself will affect for a long, long time what can go on inside it? Not any teacher working in one of the 1890-style buildings. Programs are cramped, are moulded nearly, by the room size and other built-in attributes. Our job is to provide a space that fits, that is tailored to the present program. And we're very much concerned that there be cloth

enough at every seam—enough to allow for alterations. It is not only the hem that needs letting down with the "new look." It may be the waistlines as well, with the "middle-aged look."

The site and building are planned for a specific job. So also must the classroom be planned. It must be planned to meet the specific needs of the specific school. And those schools vary. N. L. Engelhardt, Jr., lists the present range of school organizations requiring separate housing in various communities of America:

a. Nursery school for 3- and 4-year-old infants.
b. Kindergarten for 5-year-old children.
c. Elementary school, grades 1 to 6 inclusive, for children between the ages of 6 and 11.
d. Elementary school, grades 1-8 inclusive, for children between the ages of 6 and 13.
e. Junior high school, grades 7-9, in combination with (c) above.
f. Middle school, grades 7-10, in combination with (c) above.
g. Senior high school, grades 10-12, in combination with (c) and (e) above.
h. Senior high school, grades 9-12, in combination with (d) above.
i. Upper school, grades 11-14, including junior college years, in combination with (e) and (f) above.



"Little Black Sambo" comes to life in a room where children live. Bamberger & Reid architects. Roger Sturtevant photo.

And there are still others. The point is that it would be absurd to plan the same classroom for kindergarten tots and for junior high school adolescents. If nothing else the physical sizes of the pupils are different. Their curriculums are different. The job of the classroom is different.

The difference is more than size. It had to do with the basic attitudes and methods of teaching, with the difference in activity. To illustrate, kindergarten is a transition from home. It is not a place for reading skills—or written examinations. It is a place for meaningful play, a place for adjustment to group living, where there are many and varying activities, different in each kindergarten each year, different for each set of children with their needs. There are no formal standards of attainment here. This is a place for nearly complete living with little dependence on the school building as a whole. To a large extent, again varying somewhat according to the educational philosophy, all the lower grades operate a more or less complete living program where many phases of personal, and most kinds of school living go on in one unit, the classroom.

As the child progresses through the grades,

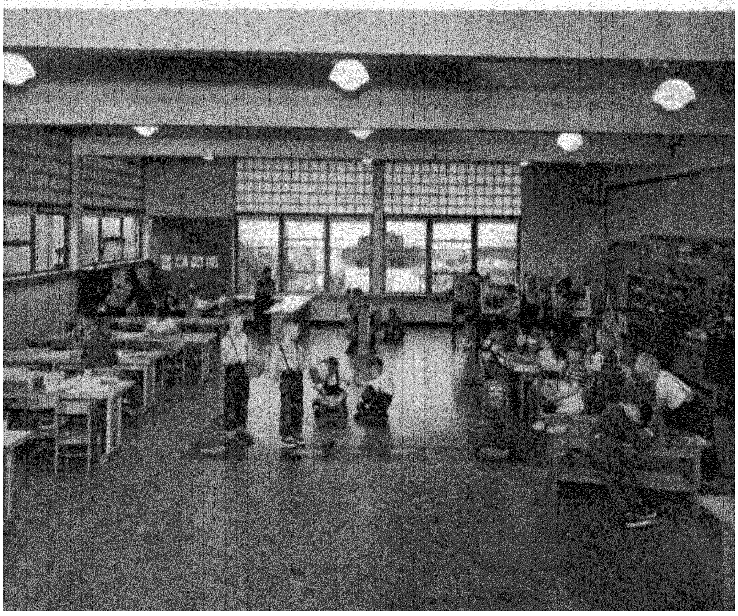
as he grows and develops, the curriculum changes. Rooms gradually specialize. Activities are specialized. The progress from kindergarten to college seems, to the classroom designer at least, a progress from the whole living of an isolated farmhouse to the compartmentalized and specialized living of an urban society. The time and rate of specialization, as well as the degree, are dictated not alone by the child's needs, but for better or worse are the product of the program; which brings us right back to the educational ideals and philosophy.

We do not choose to illustrate design based on rote-learning, recitation-study activity so familiar to most adults, and prevailing even today in many schools. The problems of design for this type of program have not all been solved, of course. But there are acceptable stereotypes galore. The greater challenge lies in the classroom for a more modern education. And with all its variations there are about six kinds of function a classroom must fill in almost any program. The relative weight of each will vary, but somehow provision must be made somewhere for all six. For convenience we shall call them:

1. Individual formal work
2. Group formal work
3. Individual informal activity
4. Group informal activity
5. Clothing care (outer wraps)
6. Toilet provision (personal hygiene)

The weight given each factor, ranging from practically no weight at all up to almost exclusive emphasis, is the basis for designing any classroom. When all six factors are included within the room, and each emphasized, a nearly complete living situation exists. When one is emphasized to the exclusion of others, a specialized room results. We have said that educational philosophy influences the design of a particular building, of a particular classroom. Another way to say it is that a particular set of attitudes and a particular set of techniques is expressed in a particular school system by the varying emphasis on these factors, and the resulting room accommodates that particular combination of formal and informal group and individual work and that particular provision for outer clothing and personal hygiene.

Let's look briefly at each of these six factors—and consider a seventh with some implications—so that each will become at least a qualitative measure to apply in checking or creating a given room.

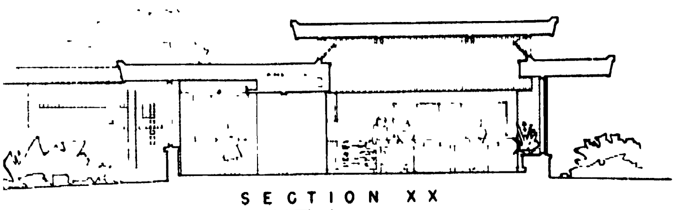


Today's kindergarten needs space—space to work and play and rest, space to store things, space to show things. William Arild Johnson architect. Courtesy *American School and University.*

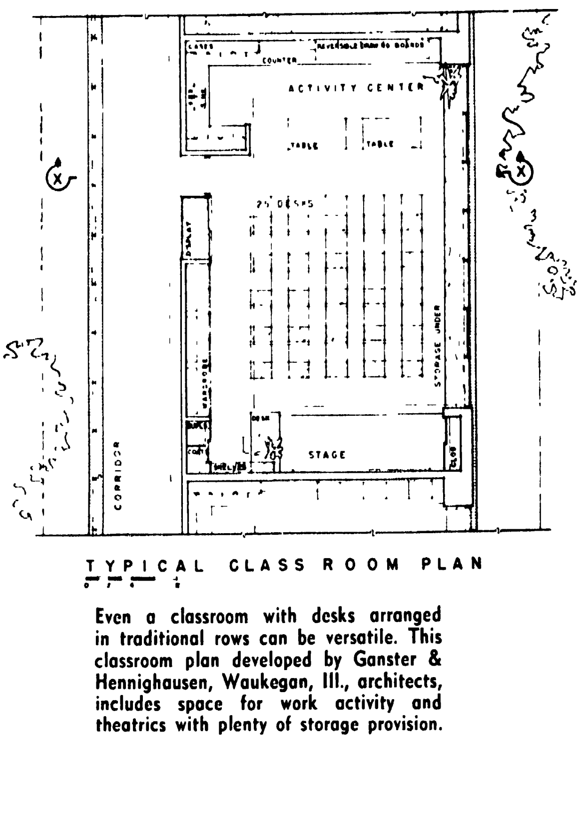
1. Formal, individual.

This is the traditional part of school work.

This is what people mean when they talk about "fundamental." In terms of a physical plant it is a student sitting in a chair before a work surface, table or desk, shared or individual. He is reading something, writing something, studying something, or looking at something while so situated. That's his place. Here he takes tests, practices individual number or writing drills, composes letters or themes. Here he receives assignments and executes them—on his own, it is hoped. Depending on how old he is these may be in terms of a work-book scrawling, pages of geography to be studied, algebraic problems to be mastered.



SECTION XX



TYPICAL CLASS ROOM PLAN

Even a classroom with desks arranged in traditional rows can be versatile. This classroom plan developed by Ganster & Hennighausen, Waukegan, Ill., architects, includes space for work activity and theatrics with plenty of storage provision.

2. Formal, group.

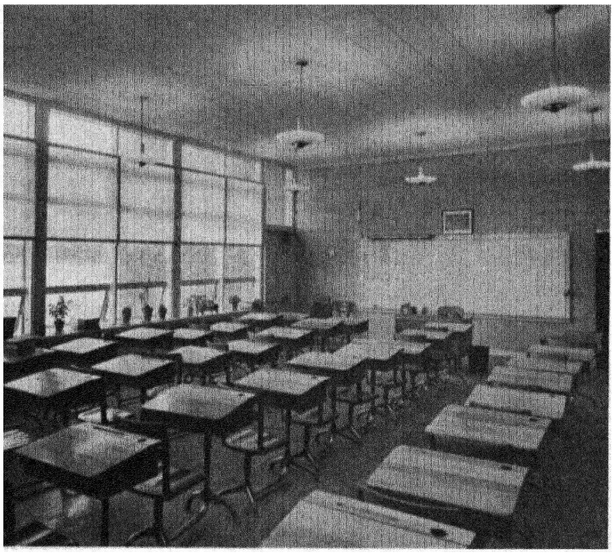
This is a group of "bluebirds" singing in the front rows, while the "thrushes" pretend to be busy at seat-work. It is a group here working quietly at numbers, there getting ready for recitation, and there sitting by the teacher doing a flash-card drill. Or it is a group gathered around the teacher to hear a story, to plan the morning's activity, to be audience and participant in turn in the day's show-and-tell period. It may be a committee planning the Indian hogan which is to implement their study of primitive economy—or planning the trip to the agricultural experimental station to see what fertilizer can do for production.

3. Informal, individual.

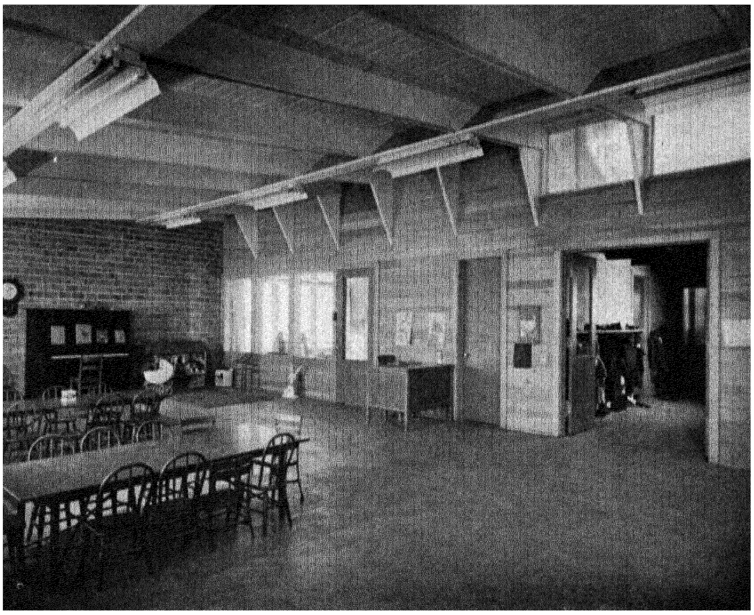
This is a youngster standing at a bench hammering two boards together to make an airplane. This is his older brother three rooms away putting a binding on his album of summer snapshots. It is his older sister working with a Bunsen burner and a flash to see what happens when water boils and steam is created. And so on. Whatever it is, it requires a bench to stand up to, a place to store things that are precious to children, some space to move around in and work.

4. Informal, group.

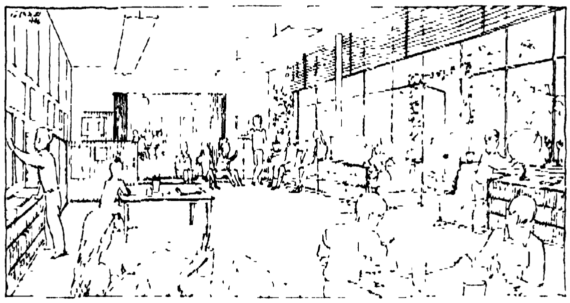
This is the Navajo Indian hogan that they read about in individual study; that they planned in their group that they are now building together, as a vehicle for simple economics, an exercise in team accomplishment. It is the whole group sitting on the floor playing their rhythm instruments in an orchestra of sheer delight. It is two groups, three groups, four groups — hammering, drawing, figuring, rehearsing—all at once. Each requires space, principally—clear space.

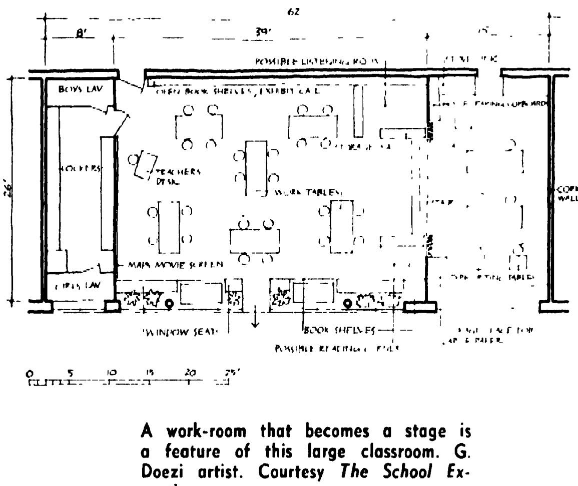


Windowheads carried clear to ceiling, yea, even unto the front wall, not only chase away shadows but give sense of space. La Salle School, Creve Coeur, Ill. Perkins & Will—Carter E. Hewitt associated architects. Associated Photographers photo.

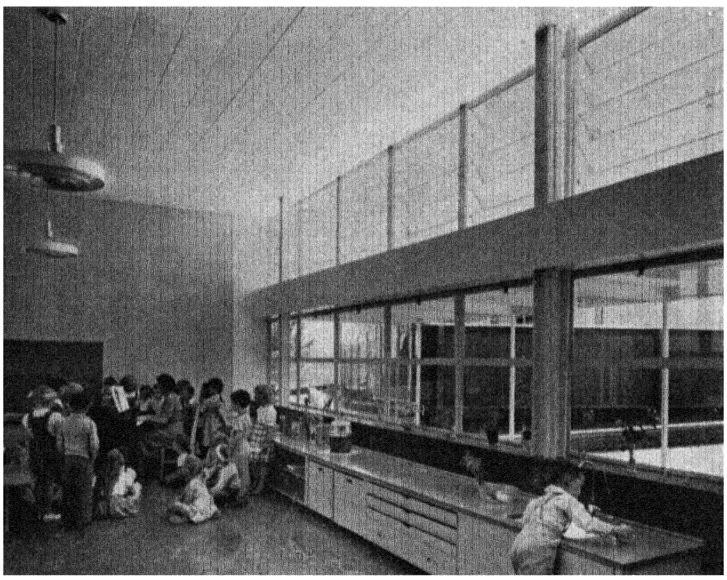


Note glass enclosed workroom, left center, which allows the class to be divided, separates noisy project work from serene study. Rugen School, Glenview, Ill. Perkins & Will architects. Hedrich-Blessing Studio photo.



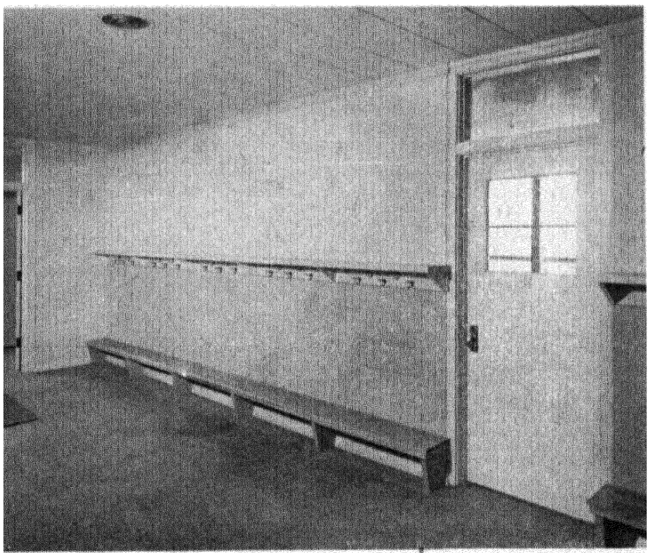


A work-room that becomes a stage is a feature of this large classroom. G. Doezi artist. Courtesy *The School Executive.*



In kindergarten and the early grades the child is learning, not so much from books, but from new experiences, new group activities as in this classroom at the Fairfax School, San Francisco, Cal. Bamberger & Reid architects. Roger Sturtevant photo.

Simple and inexpensive—and practical—clothing storage at Creve Coeur, Ill. Perkins & Will—Carter E. Hewitt associated architects. Associated Photographers photo.



Care of clothing and respect for the property of others are important phases of the early education. Note natural lighting achieved through clerestory; use of corridor wall as tackboard; decorative effect of exposed beams in ceiling. (They also serve acoustically by breaking up sound patterns.) Rugen School, Glenview, Ill. Perkins & Will architects. Photo copyright by Chicago Sun.

Clothing corner in the Sunnybrae School, San Mateo, Cal. Franklin & Kump archi-
San Mateo, Cal. Franklin & Kump archi-

It is bad planning—and it might be unsafe—to provide equipment which forces children to reach, stretch or climb unnecessarily. National Safety Council, Inc. photo.

5. Outer clothing.

These are the personal possessions of children. Included are more than outer wraps, but chiefly such things as galoshes, overcoats, sweaters—and most painful of all, snowsuits for younger ones. Are these things to be kept in a wardrobe within the room, or in a corridor locker, or in an open coat room, or in a centralized and distant locker room? Are they to be locked away, the responsibility of each one? Or is it a shared responsibility which bars locks? Space and facilities have to be provided. What they are and where they are depends clearly on the philosophy of the school.

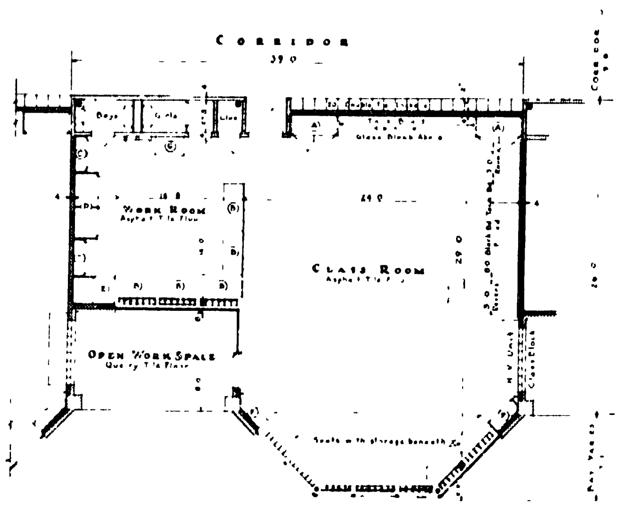
6. Personal hygiene.

Or to put it more lucidly, children do go to the bathroom and they do wash themselves (even although occasionally under compulsion). Is this part of the individual classroom function? Is this an opportunity for further help in development? Or is it a building service—necessary, but *of* the school? Clearly there are choices here, governed by the educational philosophy and the age group to be served.

The seventh function, hinted at before, is the matter of the extension of *activity to the out-of-doors.* This is discussed elsewhere, but in passing there are implications for classroom design. How about free flow outdoors and back, for one? And muddy and dirty feet for another? How much can the classroom indoors be relieved of its activity load by such an extension, if the philosophy encompasses it? Problems for design, no matter how answered.

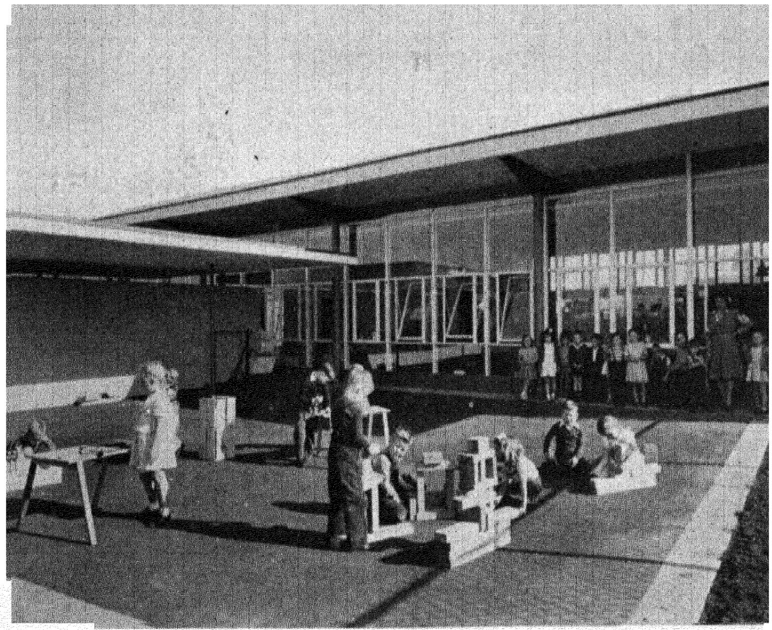
There is not the slightest possibility of illustrating all the possible permutations and combinations of these functions. It would tax the ingenuity and overflow the book. The translation of the educational philosophy into physical plant cannot be done just once for all classrooms. It must be obvious that in enlightened school programming the emphasis among these factors varies in every room for every age group. Kindergarten and nursery school children do not have the same need for conditions of close seeing and good reading that are required in a high school mathematics class, for example. The greater skills and greater specialization of eighth graders make a shop integrated with a classroom sometimes less useful than a larger central shop with better equipment in greater concentration. These are only examples. They support the unwisdom of trying to describe any categorically "correct" classroom. Since it is hopeless to attempt to describe all the

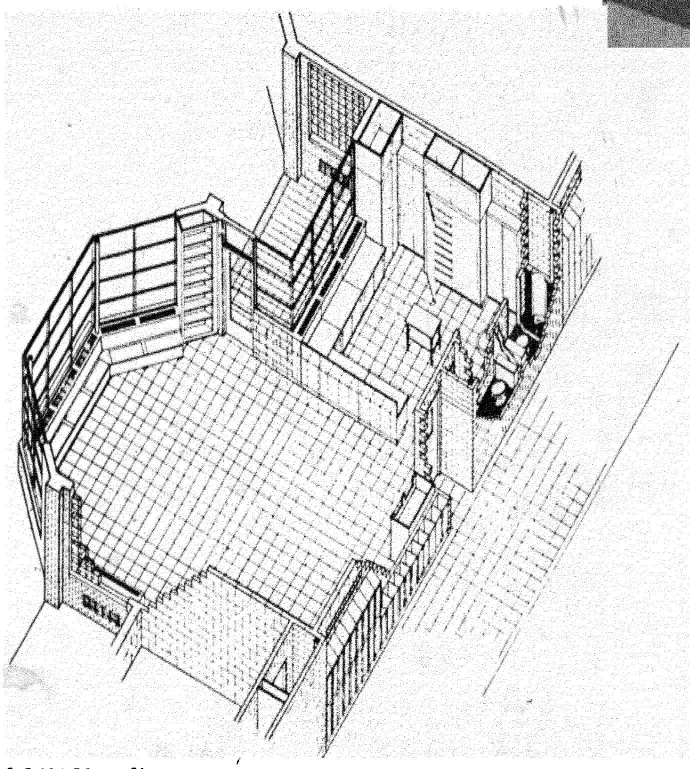
The modern elementary classroom is a place for whole living and is almost a world in itself. Mt. Pleasant Special School District, Del Robinson, Stanhope & Manning architects.



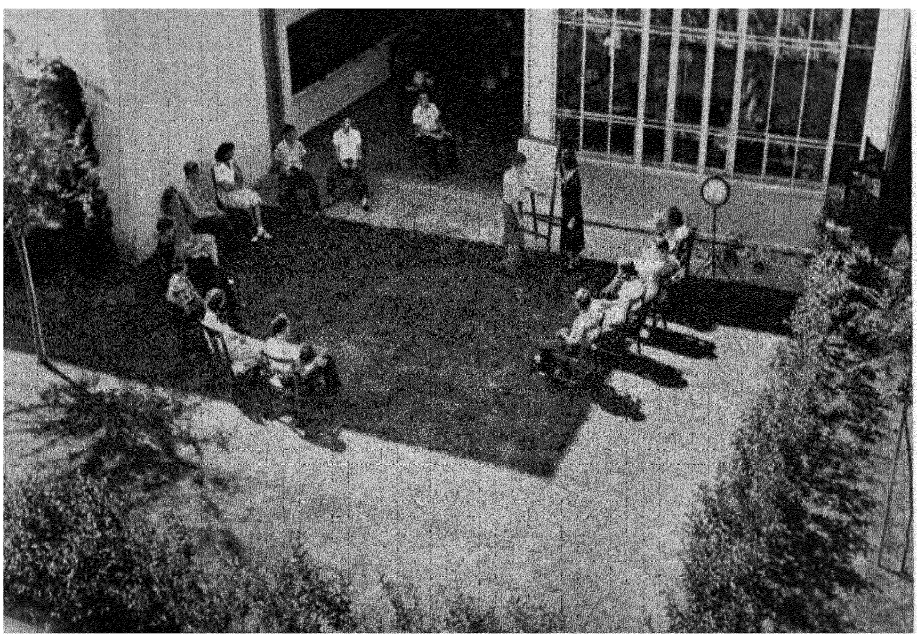
TYPICAL CLASS ROOM UNIT

Play space is learning space, too. Sunnybrae School, San Mateo, Cal. Franklin & Kump architect. John H. Lohman photo.

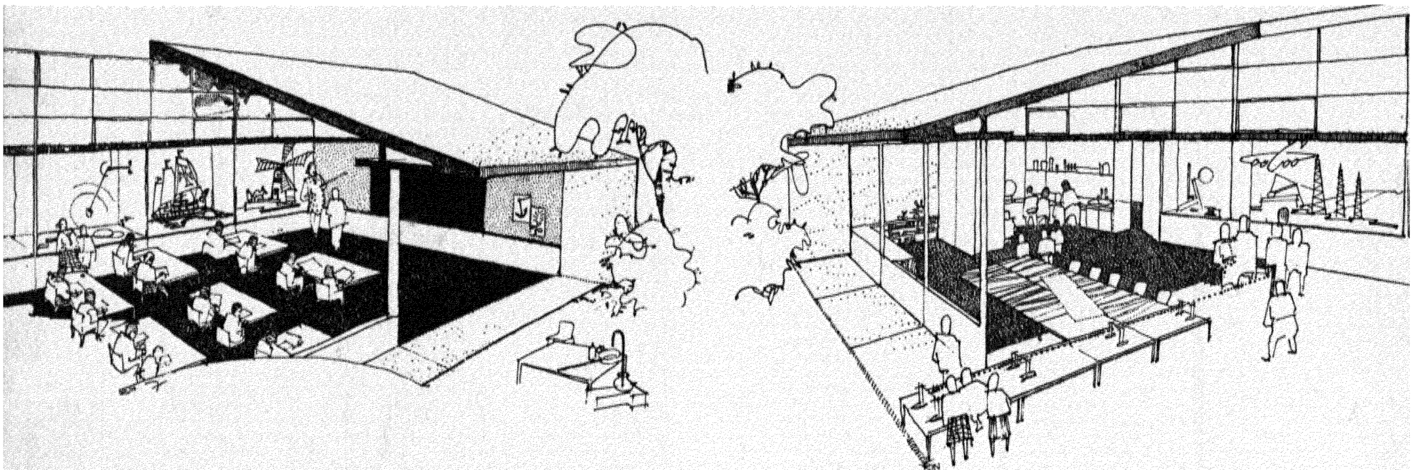




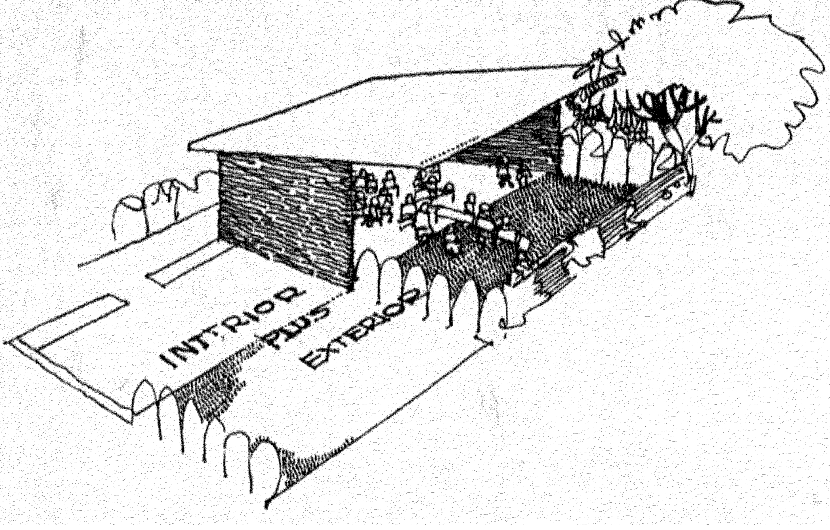
ISOMETRIC VIEW OF TYPICAL CLASS ROOM UNIT

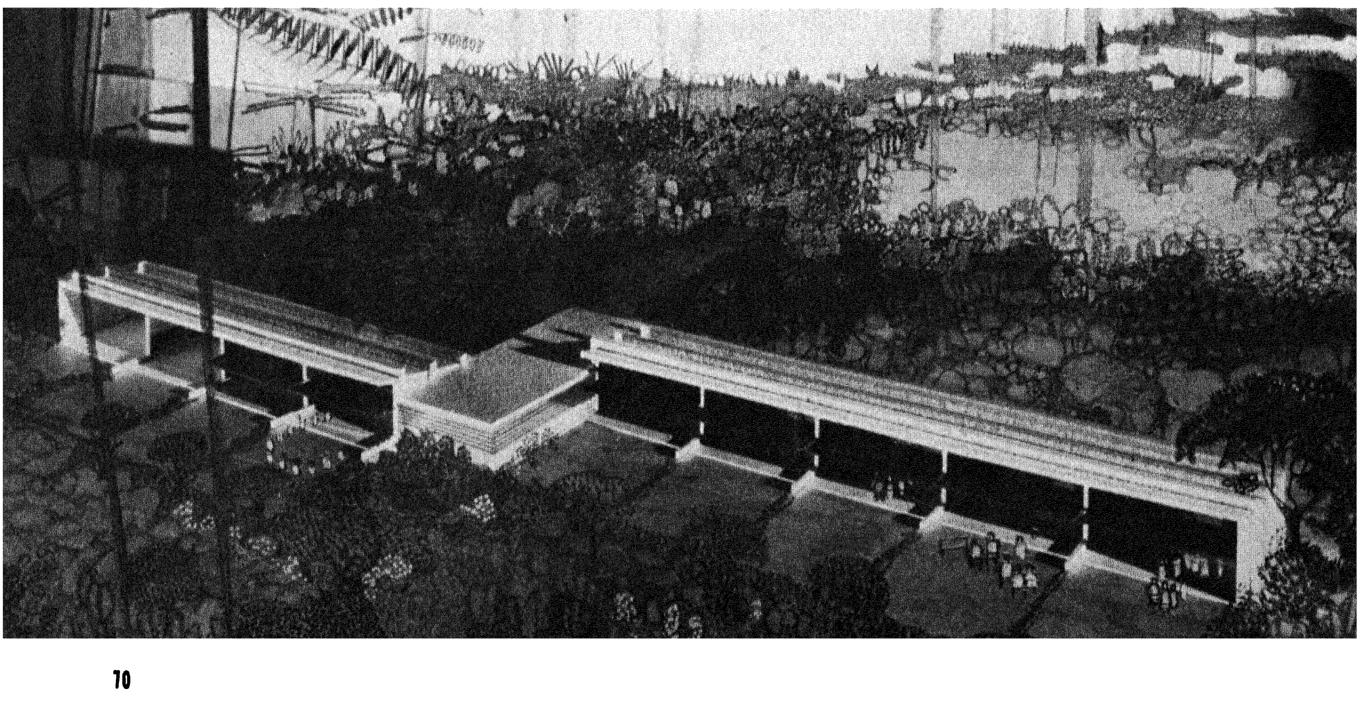


A Neutra plan for indoor and outdoor classroom adjustable for activity study. Richard J. Neutra architect. Julius Shulman photo.



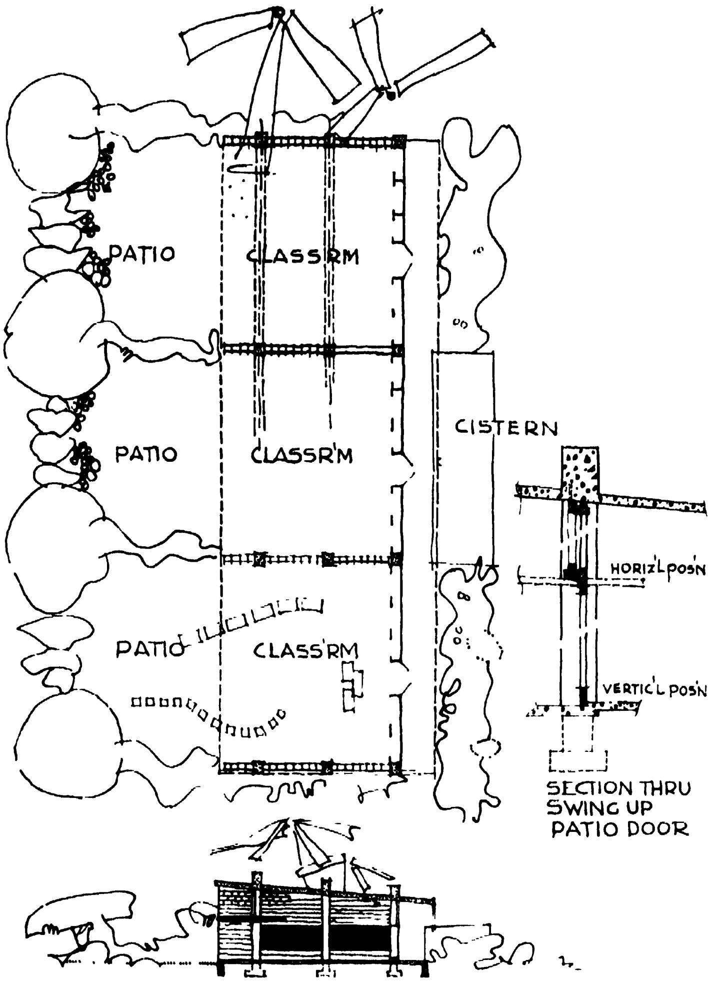
Richard J. Neutra takes advantage of the warm climate to extend classrooms out-of-doors in these plans for rural schools in Puerto Rico. Note detail showing swing-up patio door which can be used as sun shade.





possibilities already built and those yet unplanned, an attempt will be made to illustrate a method of thinking, a way of attack, an approach.

First, let's test the complete conventional classroom, so familiar throughout America. How did it get that way? Actually quite simply and quite logically. The premised function of a school was to teach reading, writing and arithmetic, and no monkey business. The integration of learning with life was better accomplished by the necessary home chores than by artificially "made" work projects. Therefore formal individual work enjoyed not only the highest priority in the design of a classroom, it was the only awarded priority. A classroom was a place where pupils could sit in ordered regularity to absorb prescribed subject matter at an administratively predetermined rate. The youngster sat quietly at his desk until called upon. Then he rose politely to his feet and skillfully and respectfully gave back his lessons. He was and did what he was supposed to be and do. The teacher's unquestioned authority and the relative simplicity of the curriculum left no place for discussion and planning. Here was the job to be done in Latin or Math or Geography, so "no talking, now!" Hence no group work. Hence no space for it.



A rackety child off in a corner standing pounding at something or weaving something or sewing something was a ridiculous and unwarranted disturbance. The place for a bench was the shop where grown-ups worked. No individual activity space was required. The repression of physical activity was almost a goal in itself. Minds, and eyes, and writing forearms worked. Absence of activity of other members seemed indication of desired activity in these. Group activity consisted of a snowball fight in the too-crowded school yard at recess time. Or if they did get together to make decorations for Christmas, or to rehearse a playlet, that was teacher's soft-heartedness. At least that kind of thing did not warrant space—costly space.

Children wore coats. No snowsuits, maybe, but boots, scarves, sweaters and all the rest. Provision had to be made: the coat room which so often became a scene of disciplinary solitude; or later perhaps a wardrobe within the room or hooks in the entry.

As far as plumbing in or within reach of the room itself was concerned, it was not possible. The means by which this has become an engineering possibility have been developed within this century.

What was the end product? Just what you'd expect. A room in minor ways varying

from the dimensions of 22 x 32 x 12. Why? Well, five rows of desks for a given age group were so wide and the aisles between them were so wide. A three-foot aisle on the window side, and the same on the blackboard side were required. Depending on the size of the desk itself this added up to something like twenty-two feet. Or twenty-four feet. Or sometimes twenty-six feet.

These desks were screwed to the floor in seven, eight or even nine or ten ranges deep to accommodate in fixed and foreordained alphabetical relationship the large classes no longer tolerable. The relationship was modified by the struggles of good-goody little girls to sit under teacher's nose and of bad boys hopefully trying to conceal misdeeds at the back of the room. But the teacher's desk planted squarely in the center front of the room, and room for work at the blackboard behind it, completed the factors which added up gave the room length. At least until some ingenious designer saved a few feet by nestling teacher's desk right up among the front pupils' desks: a revolution made possible only by the major concession that unbalanced numbers in the rows would be endured in the interests of economy.

The floor area dimensions of the standard classroom so fixed were the perfectly logical outcome and expression of the educational philosophy—of administrators and designers, if not of all teachers. Johnny was to sit in the 4th seat of the 3rd row—from which he'd rise politely and stand clear of the desk without leaning and recite when his name was reached in the teacher's roll book. Formal discipline, enforced quiet—these were routine. With minor variations such recitations were the facts in Johnny's day at school. And for what reasons should not the day be ordered for the convenience of the teacher? Or for the most efficient schedule of listen, study and recite?

Corollary to these floor dimensions which were planned before the days of successful electric lighting, it was presumed that a ceiling height half the width of the room would let in more light and permit more ventilating comfort than anything lower. This is discussed elsewhere under Lighting, but it became the third dimension of the standard classroom.

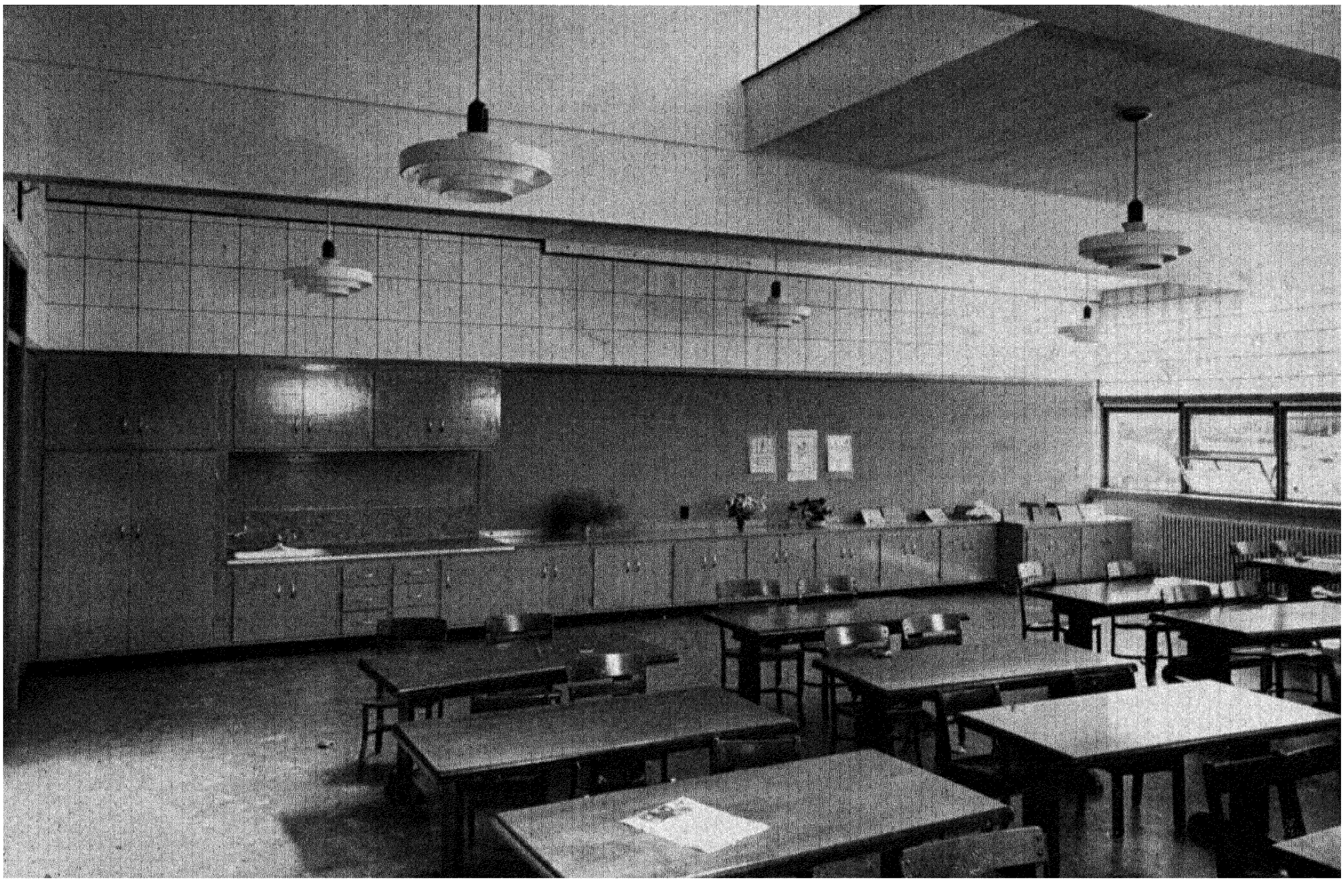
Everyone is familiar with other facets of this masterpiece of congealed logic. The blackboard was always at the front of the room for the teacher's demonstration use, and often for symmetry's sake everywhere else around the room—including window mullions! The first window was located at least five feet (or eight) from the front wall so that there would not be glare on the board. Light should always come from the left. Left-handed children were queer and were to be cured of their obduracy.

Formal individual work? Yes, definitely! Group work? Well, maybe chanting the tables together, or memorizing a piece aloud together. Simultaneous individuals working—but hardly groups. Individual activity? No. Group activity? Sheer nonsense! Clothing? Well, after all they did have it—but it was a nuisance not a problem. Hygiene? What was good enough for father was good enough for child. After all, Lincoln was an educated man.

But suppose the philosophy of education under which you are working says, in effect, that a classroom is a place for a relatively complete living experience for each student. Suppose it says that arithmetic is not just figures in a book—it's making change at a grocery store. Suppose it says that the understanding of an airplane can be enhanced by making one, however crudely. Suppose it says that students' minds and voices and spirits can interact in shared experiences to the benefit of all and the growth of each, enlarging loyalties, building appreciation of the other fellow, inducting into the mysteries and joys of teamwork. Suppose that the necessities of clothing and hygiene are interpreted as opportunities to educate, certainly in the lowest grades, just as surely if not so spectacularly at every level? Suppose these necessities are to be planned to get maximum enrichment of the educational program and minimum interruption and inconvenience in the daily living? Suppose that the individual is important—really, centrally important? That he is to be free to develop as an individual as well as a member of a democratic society? That he is to be measured by other standards than only whether he can handle 18 simple fractions a minute? What does this mean for classroom design? What does it add up to? First, let's look at what it does not mean.

It does not mean that Johnny is to be pigeonholed at a fixed desk which forever faces forward toward the seat of authority. It does not mean that the room is a rigid mechanical box. It does not mean that it is drab and colorless. It does not mean an institution-like place with awesomely high ceilings. If this seems like dancing on the grave of an already dead past, we remind the reader of the hundreds of rooms that are being built by rote and habit in the wake of such rigid thinking.

The authors are under no illusion that good



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Large, well-lighted rooms with chair and tables and modular cabinets make flexible rooms and flexible programs. Edmonds School, Edmonds, Wash. William Arild Johnson architect.

A primary classroom at Crow Island School, Winnetka, Ill. Perkins & Will architects. Hedrich-Blessing photo.

teaching is a recent convention. They take no credit for having discovered any of the six functions listed above. Each phase of this kind of teaching has been done well in many places and we know it. In a few places, even, classrooms are being designed to fit these functions according to a well thought out educational philosophy. However we should like to report on the design of the individual classroom at the Crow Island (elementary) School in Winnetka as an attempt to meet the problem of full classroom experience in terms of architecture—probably not for the first time, and certainly not the last. (See page 73.)

The program there evolved from months of study on the part of teachers, architects and administrators. It said that the classroom was to be a place for a fully rounded learning and living experience at each age group; that each room was to be a colorful, flexible, child-scaled work space where the learning activity of childhood could be channeled effectively and pleasantly. Fixed seats were ruled out. A room had to be provided where each seat could be placed in any position in relation to the other children, in relation to the teacher, in groups or as individuals, or sometimes even in the formal rows that have been mentioned elsewhere. Twelve-foot ceilings were barred. Nine feet was accepted as a reasonable residence-scale compromise. Light "from one side only" was removed as a limitation. Two sides were insisted upon. Color, warmth, and a place in which to work and act vigorously—these were keynotes of the earliest program.

From these generalizations, what happened? In the lower grades chairs and tables were the rule. A chair and a table for each child, and a drawer for his immediate working tools. For the older children pedestal desks — but movable desks — were decided upon. The individual formal work could go on in rows, groups could work formally together in variable desk combinations, in circles and hollow circles for the exchange of thinking and effort as decided upon in the teacher-guided democratic processes. This requirement was neither remarkable in concept nor unusual in handling except that enough light was available from enough directions so that the windows did not by their very position unalterably fix the seat-desk positions.

Another requirement for this particular program was "formal group work." It was not called that, of course. It was merely the expressed wish of every teacher for a place within the classroom where children could gather comfortably in a compact group—preferably by a bay window. There was not one dissenting voice in the entire school system on the desirability of some kind of alcove or bay abundantly lighted for this purpose. Rugs already abounded in the system, but a pleasant place toward which the rugs and children could gravitate was notably missing. The bay window as such was never built. But no one missed it because the intersecting planes of the two glass walls and the bench which follows along as a sill below them have become that bay. What was not apparent in the design stages became fulfilled when the room itself in all its dimensions was exploited. The continuous bench reaching out both ways from this corner has become a welcomed gathering place for groups, and continues to serve the group functions of a more formal nature in these rooms.

An interesting sidelight here: When the limitations of the budget became apparent, two choices appeared. These were put to the faculty for decision. Would they choose large classrooms without the bay? Or would they have the bay at the expense of two feet of length in the room itself? They chose the larger area. Then after moving into the building a year later they discovered they had their cake and would still be able to eat it. The corner window became a dividend in the form of an unexpected bay.

This particular school system was very fully committed to the teaching method which made vivid and real the book-learning subjects by doing something about them. As part of the classroom a workbench, separated from the larger area of the room but still part of it, was requested. This was to be a place for hammering, painting, weaving, sewing. Here Johnny could go and make a boat or an airplane or paint a picture of Indians, or otherwise make vivid and real for himself the characters and thoughts that emerged from the books and stories of the big room; that became the vivid projected realities emerging from his own hands and experience. It was considered important to be able to shut this part away somewhat from the rest of the room. An "L"-shaped alcove was provided. Each youngster had a place to store his own possessions under the bench. Electric light outlets, gas fuel outlets and Bunsen burners, vises, saws and hammer—all were ready so that a gifted teacher could use the restless energies of an unbookish boy to make vivid to him what others might grasp by other methods.

For that work where the whole class operated as a team more space was provided; space diagonally opposite and farthest from the intersecting corner windows which made

the bay. On this wall, farthest from the best light, was located the storage space and the materials for the things that children could do together. There the hogan illustrated on page 39 found its way into existence, as have successive efforts too numerous to recount.

In summary, formal individual work had well lighted space for desks and chairs. The group work got a bay window. Individual activity had a workbench in an alcove which could be closed away. And the large group activity had space—the less valuable space away from the windows. Arranging these in relation to each other, assigning quantities and priorities to each, and testing them against the budget, these designed this particular classroom. The hygiene function was taken care of by an individual toilet room complete with washbasin. This is discussed more fully under Plumbing. Opening into the workroom itself, a sink serves not only as supplementary washing facility for the children, but provides water near the activity part of the room for the host of things that need water in the course of the day's program: plants and animals to be watered, water-color pans to be filled and emptied, for example. Over this sink is a drinking fountain. No disorganized corridor travel—and probably fewer drinks when adventure is taken away from the trips. For clothing, since the corridor bore a particularly light load because of the flexible recess schedule and staggered dismissal times, it was decided that the corridor would be a perfectly good dressing space for overcoats, overshoes, and even snowsuits. Such has proved to be the case. In a larger school with heavier traffic in the corridors, it might not have been wise. But here it works.

Other details of this classroom included a 16-foot blackboard area and abundant wood vertical siding. This latter not only was an architectural feature itself but the most successful bulletin board imaginable. Teachers and children have been provided with thumbtacks and instructions to use them, rather than preserve the walls. Also, as a by-product of the attempt to get light through two walls of each classroom, an outdoor classroom was provided between two indoor rooms. Although this may not be justified as an end in itself in the north temperate zone, it has proved a valuable and pleasant adjunct—immediately available from within the room. Light is controlled by draw curtains which are themselves a source of color and delight and are practical in modifying the sun glare in large glass areas. Venetian blind pockets were provided against the day of future riches.

Another detail grew out of teacher need. Book shelves are provided as a sort of room library in each room. Lift tops were built into the benches under the window to make available storage space for tennis shoes or whatever.

An acoustical ceiling interspersed with concealed incandescent lights completes the physical design of this room. The esthetic design was completed by the warm wood colors seasoned with the brightness of colored shelf backs, doors and window divisions, the branches of the planting reaching up past the very low sill and into the decorative scheme; lively terra cotta inserts across the little court to give differently storied interest to each room.

This design is not offered as a standard to be copied. We do not think it should be. There are too many ways in which it can be improved upon in the light of what has been learned of a technical nature these last ten years. There are too many honestly differing educational philosophies and programs—too many varying needs in varying communities. This is merely to illustrate a contrast with the traditional classroom, where few tasks and rigid conceptions brought forth one design, pretty well standard. A complex program with fluid and growing conceptions designed this. The source of better designs than this can never dry up. It is always there: living children with expanding needs; a growing science with improving achievements; higher standards of educational attainment for each successive roomful of children. If the designer looks steadily at these three factors, it will be difficult to repeat a design until his own learning has stopped.

To illustrate the six functions at another age level where the whole life within one room may be undesirable, let's take a quick look at a classroom in a junior high school. If it's where French is taught the formal functions dominate. Work is mostly individual. But the conversation method supplements book learning, so there are overtones of formal group work. Probably the room should permit a hollow square, semi-circular or even circular seating, in contrast to authoritarian rows. As an example of more purely group academic work consider the visual aids room which doubles as a little theater, an English speech room or a space for light dramatics. Individual activity is a conspicuous function of the wood and metal shop. At this stage the need for more and

better equipment has separated this specialized function from the classroom. Group activity is the primary function of the stage construction shop which is part of or adjoins the shop just mentioned. Teams of children make the scenery here for the forthcoming production of Snow White. Corridor lockers and toilets grouped along the halls have supplanted the individual room provisions for these functions. However all six are still determining spaces and by omission or inclusion the design of classrooms.

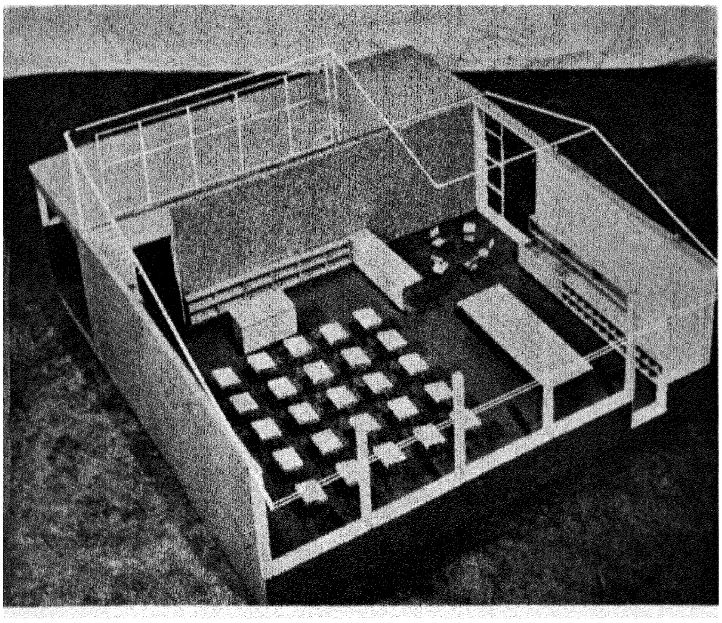
A classroom type which is rising in popularity and importance is the deep, square room thirty feet on each dimension. This actually has as much area and can do as many things as the Winnetka classroom described in much detail. There are two important differences. First, the technical possibility of this size and shape has been achieved by advances in natural and artificial lighting since the Winnetka School was built. Other technical progress in acoustical and visual controls contributes. Second, the educational philosophy calls for the full six-function treatment under conditions of greatest fluidity and flexibility. Everything that was done under somewhat compartmented conditions in Winnetka is achieved by movable storage cabinets and benches which set off areas—areas which can change with use. As a mathematical exercise it can be shown that this room is susceptible to the widest range of variations of use. As an instrument of education it is a liberating device. It makes possible almost unlimited furniture arrangements, better audio-visual situations, interesting work alcoves, library centers and the rest. Experience shows that with proper and adequate technical treatment of acoustic and visual surroundings an atmosphere of varied activity and freedom can be achieved. Next year's class, next year's curriculum, next year's teacher can adjust areas, move things around, can fit the room to their needs.

A third type of classroom is illustrated at Glenview, Illinois. It is assumed here that visual control over the entire class must be maintained by one teacher but some divergence of activity will be taking place. A glass-enclosed workroom is provided. This allows a class to be divided some parts of some days. Where cadet teachers are being allowed to handle one group under general supervision of the teacher who is working with the other group, this is a helpful arrangement. Or it may be desirable where a four-room school is accommodating more than four grades, and point is given to the necessity of dividing groups.

A fourth classroom, as yet to be fully developed in actual construction, really exploits a program which calls for full and vigorous use of audio-visual aids. The illustration is designed around a problem involving a multi-story building, nine-foot ceilings, classrooms thirty feet from window wall to corridor wall, windows for vision and pleasant living but not for lighting, and a first-rate job of artificial lighting which will zone and curtain the room so that botherless darkening will actually foster the use of these newer tools of learning. By pulling the curtain shown separating the activity portion of the deep classroom from the windowed part, enough shadow is generated to permit showing of slidefilms, movies and all their allies. Chairs are brought over from the chair-table area. Remove any one of the factors listed as conditions above and this design will be wrong. It is, however, a response to the problem which is being posed with rising insistency.

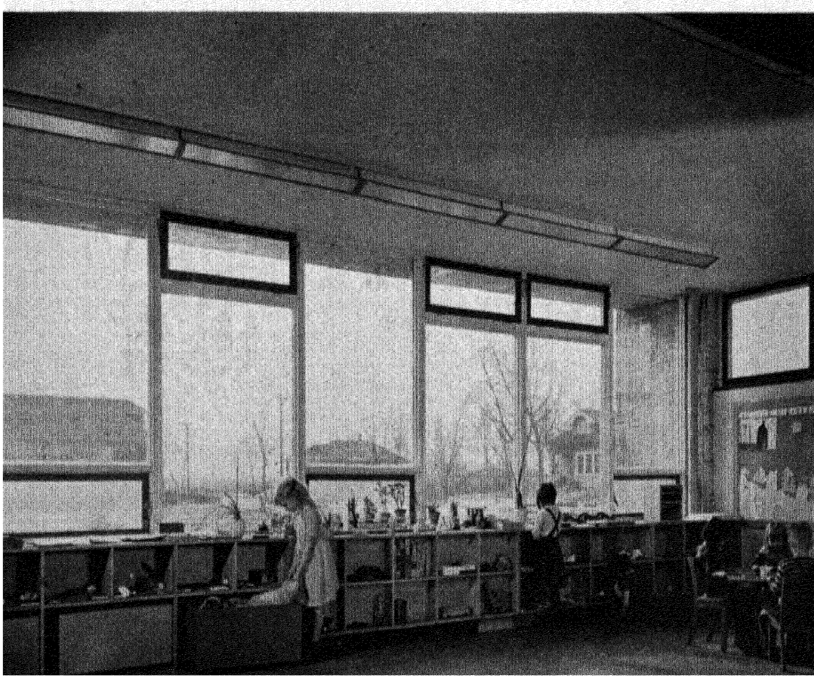
There is nothing particularly mysterious about a classroom. As it serves children, it is a space in which children are to be comfortable and well accommodated as they engage in a specified range and amount of activity, using certain types and sizes of tools and equipment. Both are spelled out by the educational planners. The architect works with those planners, but he does not supplant them. And he should not have to guess.

Recently, as portrayed in the Prologue, classrooms are being called on for new functions, or at least new arrangements of the old six functions for new sizes of human beings. If the Voceks and the Bills and the Kilroys are to be served, that too has implications for design. It involves planning for night use. It involves planning for bigger people. It involves storage space and storable furniture to fit the adults and their activities. It means that most of the child-designed furniture must be cleared. It may mean keeping one portion of the room sacred to incomplete hogans, another to the half-finished model homes, blueprints, miniature stages of the grown-ups sharing at least the major part of the space otherwise left idle so many hours. Here is a job for real ingenuity—a challenge to efficient design. Specifications of activity and equipment must be furnished by planners, but the solution of the problems lies squarely in the architect's lap. And if we are to keep faith with the Voceks, the Joneses, and all who have worked so hard to plan, buy and pay for this space, these problems must be solved.

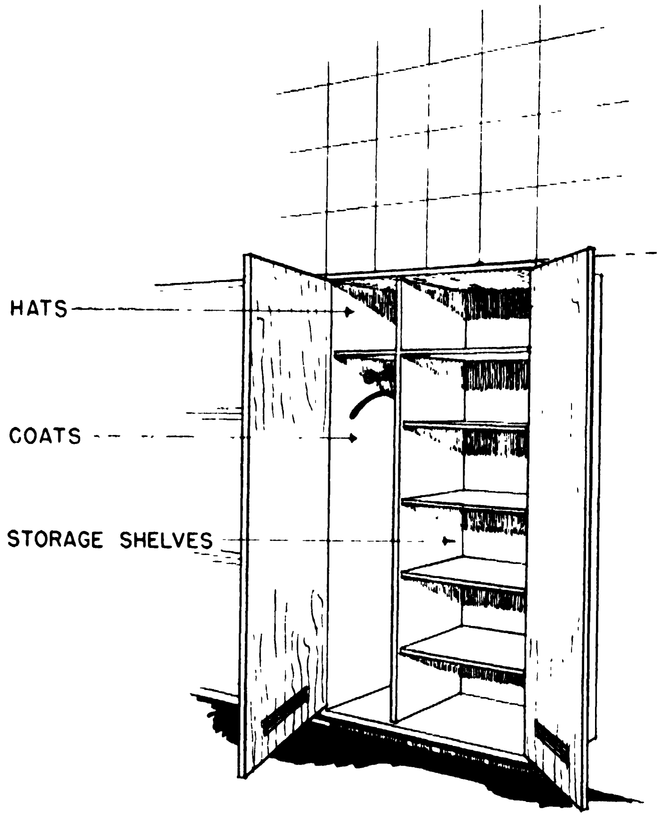


Model of a classroom shows how naturally the square plan lends itself to three separate zones of use without structural subdivisions. Room shown in model is one-half of a classroom pair. Adjoining it is a duplicate with reversed plan. Together they make up one of the "little houses" strung on passage. Community Elementary School for Lincoln, Mass. Anderson & Beckwith architects. Courtesy of *Architectural Record.*

Model showing another possibility of the squared plan. Perkins & Will architects. Courtesy *See and Hear.*

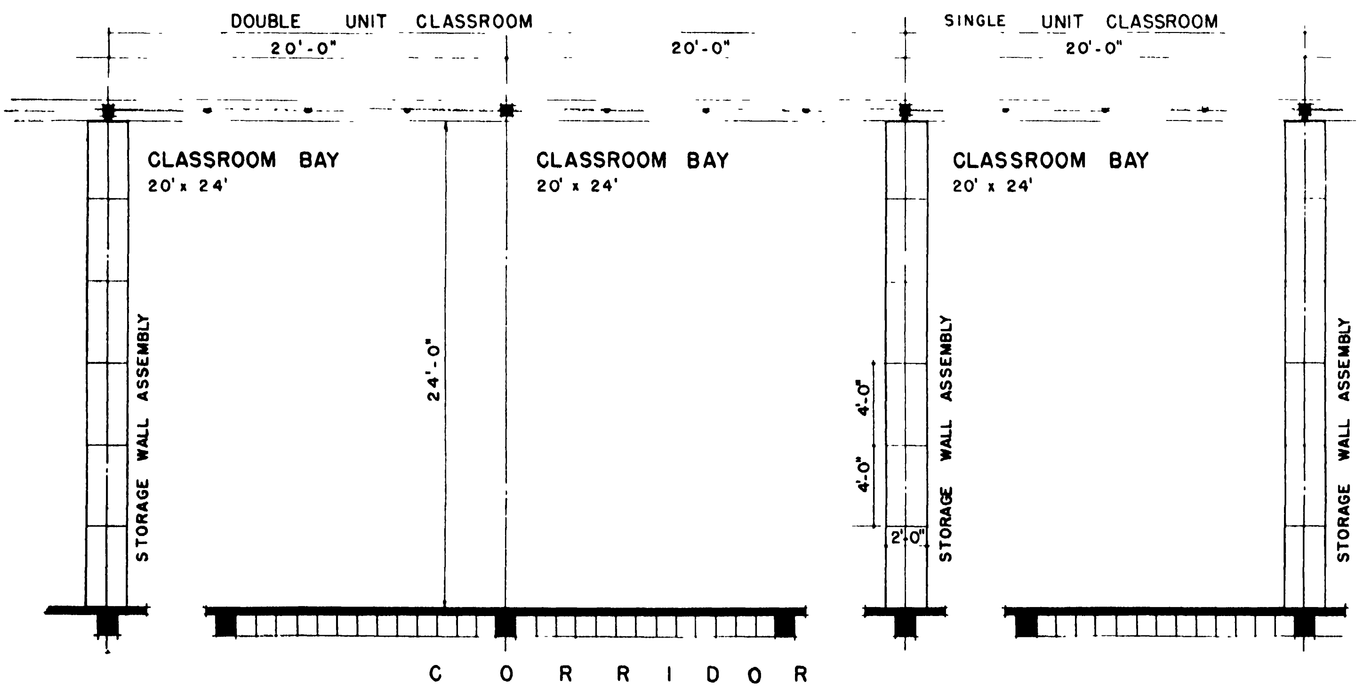


Plenty of things to work and play with; plenty of places to store them—in stationary cabinets and in movable bins. Drexel School, Cicero, Ill. Perkins & Will architects. Hedrich-Blessing photo.

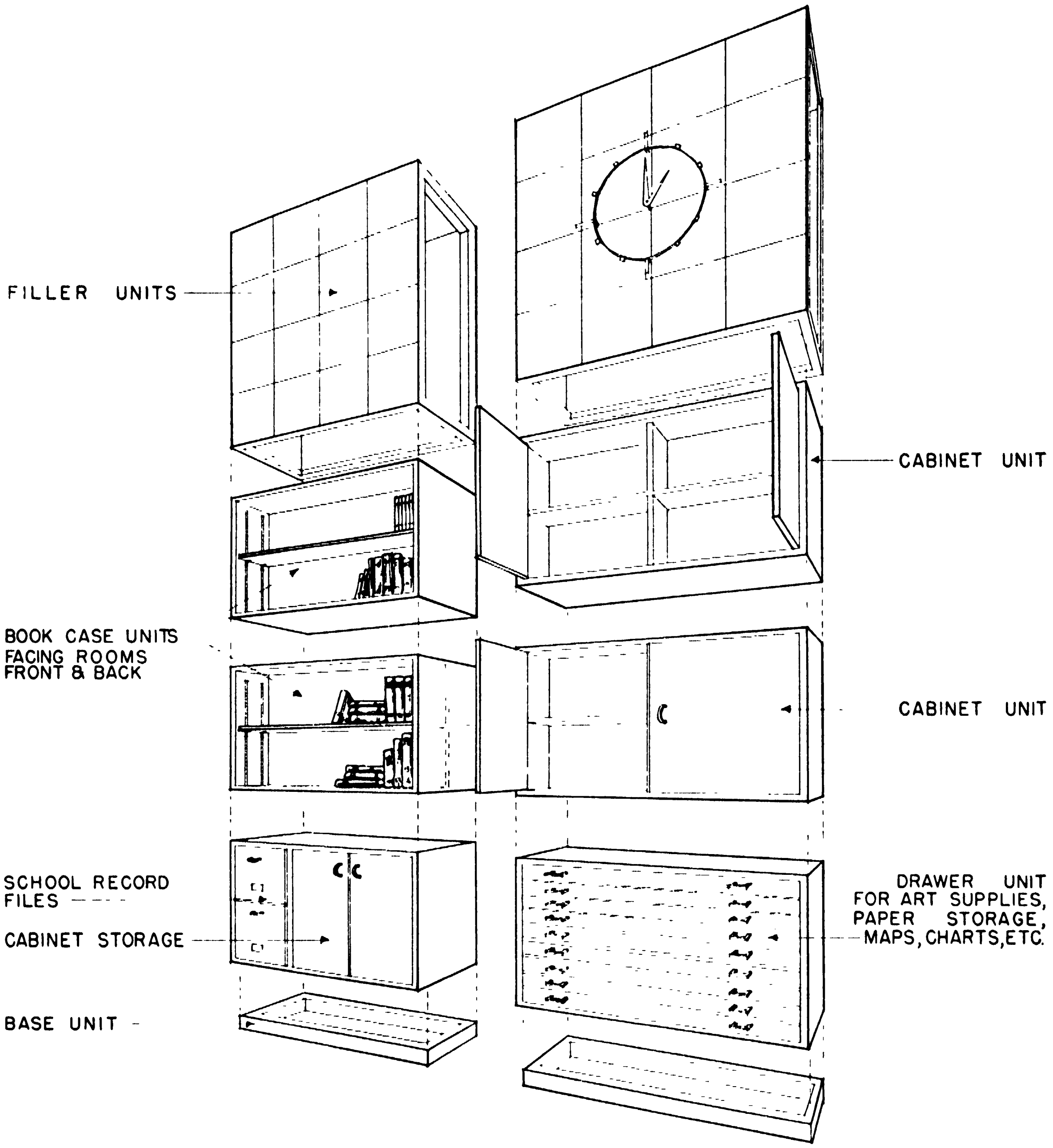


TEACHER'S CLOSET UNIT

These storage cabinets are designed for particular jobs, are interchangeable, and form a dividing wall between classrooms. Illustrations on pages 78-81 by Mc Leod & Ferrand architects. Courtesy *The American School and University.*

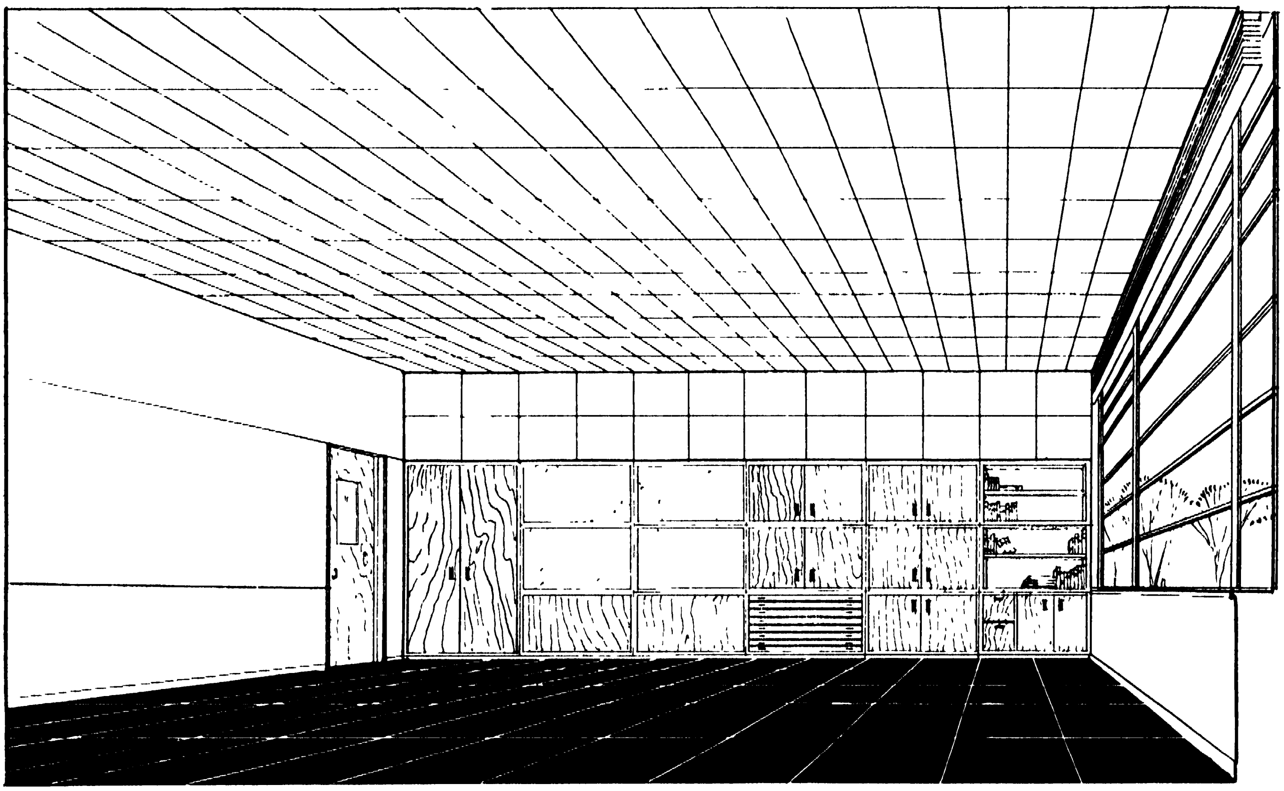


CLASSROOM PLAN SCALE 5 4 3 2 1 0 5 10

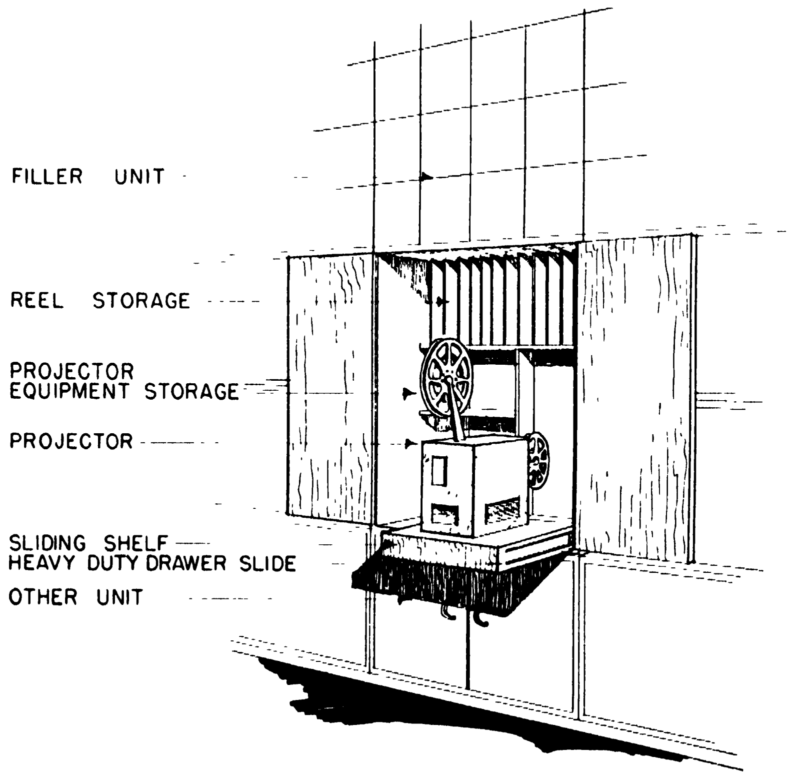


STORAGE CABINET ASSEMBLIES

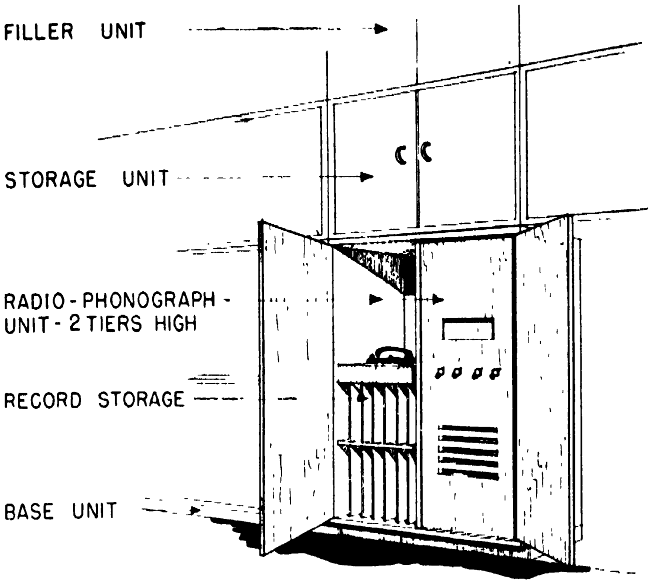
Modular cabinets are helpful. Flexibility is possible within the units as well as in their order. Why not have a clock showing time in various countries?



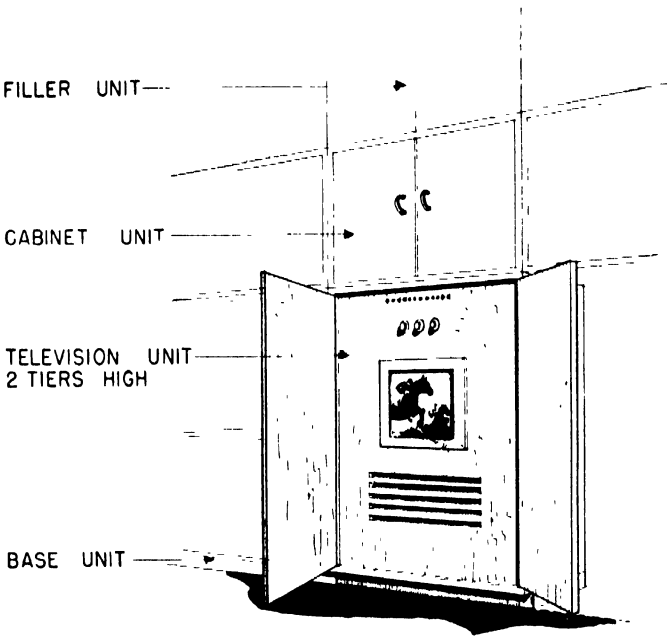
Above: Another type of storage wall.
Below: An ideal sound projector unit.



FILM SOUND PROJECTOR UNIT



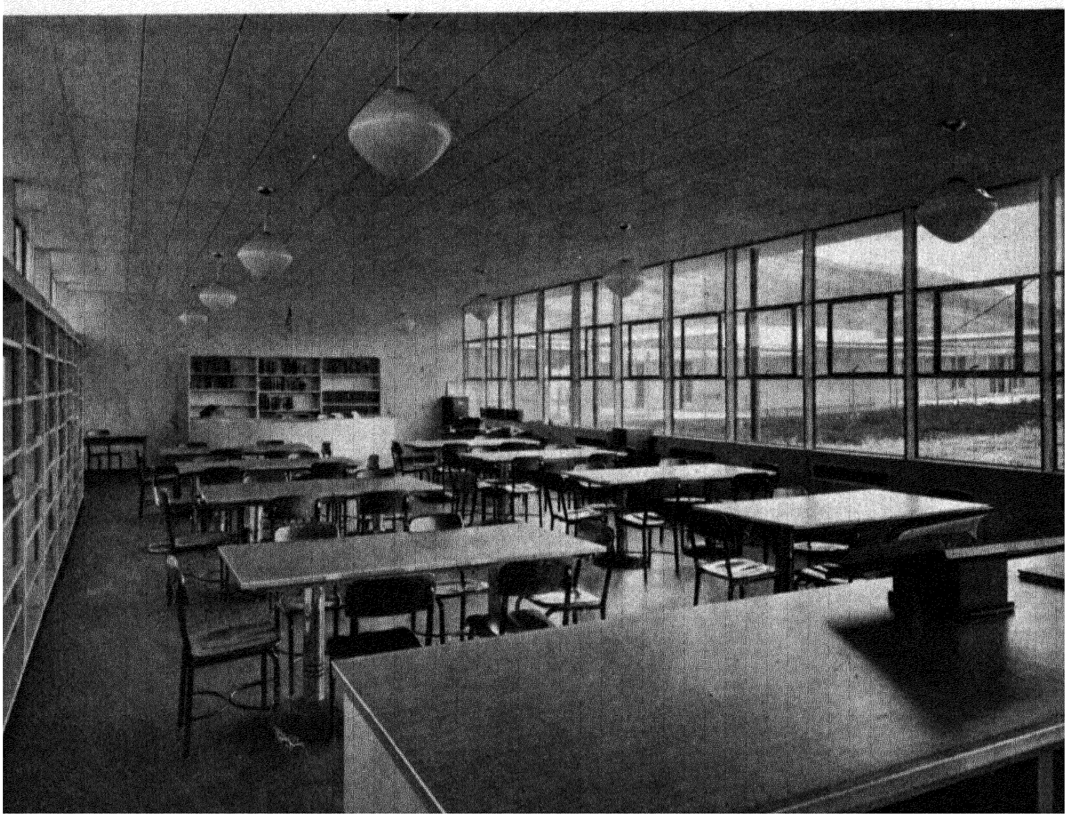
RADIO - PHONOGRAPH UNIT



TELEVISION UNIT

There should be furniture and equipment suitable for adult use.

Library reading room in the Crow Island School, Winnetka, Ill Note fireplace, low wall bench, contoured furniture, over-shelf cabinet storage for maps, posters and other materials, ceiling of acoustical plaster. Perkins & Will architects. Hedrich-Blessing photo.



Library in Acalanes Union High School, Lafayette, Cal. Note acoustically treated ceiling, clerestory lighting, wide adjustable shelves for magazine storage. Franklin & Kump architects. Gabriel Moulin Studio photo.

Much too much has been written about the specifics of classroom design. Much too much has found its way into law. Future generations of students will profit by the scientific research, the spirit of inquiry, and above all, the competent design thinking which leads toward the creation of beautiful and effective environment for learning, in that space we call the classroom.

Library

The educational program will reflect the attitude of the planners toward the function of the library. Is that attitude one of encouragement or sufferance? Is the library planned to offer an opportunity for the student to delve deeper and roam farther into new and strange and delightful worlds of knowledge; or is it regarded as a necessary evil?

Let us consider that the library is a place for the storage of books. Let us go a little further and consider that the library is a place not only to store books, but to read books. Then let us consider that these two major functions should be performed efficiently. Thus, the library should be conveniently located near home rooms, study halls, English and social study classrooms. It needs space, light, ventilation, quiet, and —because of its unique function—that intangible known as atmosphere; and esthetic environment that attracts rather than repels the child in the school and the adult in the community.

If the library is to function mainly as a supervised storage bin, its requirements will be small; its impression on pupils and community will likely be in proportion. It could be designed to accommodate shelves, which would accommodate books, plus a desk for convenience in charging books in and out.

If, as some very noted educators think, one of the purposes of education is to introduce people to books, encourage them to read in school and throughout life, then certainly learning to use the library—and using it—can be an important part of the educational job.

Here is how the noted San Francisco architect, Frank Wynkoop, visualizes the new library for the new school:

"The ideal library would be a one-story structure, semi-detached, and centrally located.

"It is difficult to explain why certain interiors are pleasing—why they have what is called 'atmosphere.' It is possible to analyze the reasons, however, and to design atmosphere. The library should be envisioned as a quiet spot for contemplation and study, just as it would be in a home. It should provide surroundings in which the mind is instinctively conditioned to respond to the subject matter. Influencing these conditions are temperature, conditioned air, brightness ratio of light sources, light intensity, and the comfort provided by furniture, sense of quiet, color, materials of the surroundings, the view to be seen through library windows, objects of art within, and very important, a non-ticking clock.

"The esthetic concept of the ideal library will depend a lot on the funds available, part of which must go for the purely mechanical equipment and other requirements.

"The library interior need not be a large and lofty room with tables crowded into regimental rows. Rather, treatment should be intimate and light. Meaningful murals should be restricted to lobbies, museums, or waiting rooms and not placed in libraries.

"Adequate daylighting will insure a light and colorful interior. Windows to the east or west create control problems, so light should be admitted by means of south or north windows or by directed reflection of sunlight to overhead diffusing surfaces. Artificial lighting should be flush with the ceiling and of low surface brightness.

"Class period signals can be two-toned chimes instead of bells. The use of a sharp bell and the anticipation that it is about to ring should not be present in the library.

"The library program which has already come to include audio-visual materials, recordings, library classrooms, microfilm, and television, will undoubtedly continue to expand. The library, therefore, should be flexible in order to accommodate developments as yet unforeseen. Construction should allow for the expansion and rearrangement of departments, and for relocation of exterior walls in order to provide more interior space. For example, the building may be planned as a system of bays supported on columns with no bearing walls. The daylight is introduced from above. Such construction is capable of expansion without relation to exterior walls, nor is it dependent on side wall windows for lighting. However, windows should be provided for outdoor views on at least two sides.

"Reading room and stacks should be arranged with movable double-faced book shelves in rows approximately four feet in height. These shelves are most convenient when located in the center of the general reading room with tables and easy chairs arranged in alcoves around the outer edge of the room. The old type library with rows of tables in the center of the room and shelves lining the walls requires too much cross movement on the part of library users.

"The arrangement of subject matter in this ideal library should be made flexible and convenient to reading groups. Microfilm can be used to reduce the bulk of growing collections.

"Reorganization of space should allow 50 square feet of floor space per reader in the circulation and reading sections, instead of the usual 25 square feet. For the initial en-

rollment of 500 students, a library will accommodate 70 students in a space 40 by 80 feet. The master plan should provide for a second circulation and reading section for 1,000 to 1,500 total enrollment. Space below the main floor can be reserved for infrequently used reference material and for the library laboratory of the future.

"Noise reduction treatment should be provided according to the specific noise problems of the school. Sound deadening may be achieved by combining acoustical treatment with thermal insulation. A material using rock wool or glass wool serves very well as insulation against outdoor sounds and to absorb inside noise.

"The floor should be of resilient material, preferably a light-colored linoleum, for ease of maintenance. Doors, wood trim and furniture should be of natural wood with a light stain. Stone or marble can be used in exterior loggias or in the event that a fireplace is planned. Visible glass areas should be confined to side wall openings, not to exceed eight feet in height. The rooms should not rely on window openings for ventilation. Wall panels should be sectional and contain thermal insulation.

"The ideal library may be achieved by utilizing the ideas suggested here, or its particular problems may be solved in another way. Planning, however, should put emphasis on space and more space, as well as simplicity of arrangement and detail. Above all, the architect should be permitted to put his special knowledge and vision to work without having to conform constantly to established forms and outmoded traditions. *

For smaller schools, such as neighborhood elementary schools, Caudill suggests that the central library be used as a supplement to the libraries in each classroom; that twenty-five square feet per reader be allowed; that the shelves be open and not more than five feet high, allowing for eight books per running foot. It is Caudill's estimate that the library would average accommodating about one-tenth of the school population and provide for five volumes per reader.

Both Wynkoop and Caudill are suggesting standards. The planning team will consider these standards, but devise their own. Perhaps the local situation makes it expedient to combine the librarian with the visual education director—making a teaching-aids supervisor. This would mean storage space (highly fire-resistant) for films, projectors, picture units, etc. Even perhaps the museum-laboratory may be added in combination, where other units could be stored and displayed—where perhaps small groups could come to do science experimenting with a gas-hood, where a central distribution point would make more science kits, more teaching aids of all kinds more easily available to all classes. Whatever the decision, even in the library, about which much has been static these many years, there is a strong case for wise and foresighted educational planning, and intelligent design.

Is the library to serve only the youngsters in the school? Is it to serve the community, either as a library or as a meeting place for smallish groups, providing atmosphere? Then, will the same seating and worktables serve both sizes? Or what will the designer do about storage and storable furniture? This is not an insoluble problem—just one which has not been studied much. People have been quite used to seeing the big monumental school dark on winter evenings. Architects have not had to find solutions to this problem.

Offices

An office has a greater function than merely a place in which to shuffle papers and coordinate records. True, it has that one. But it is a point of contact between the school and its central administration—between the school and parents—and if it is to be good at either of these, it must be a contact between the whole school and each of its parts—each student.

In the purely administrative sense a case could be made for putting the office in this outline under service functions, like the boiler room—a place from which to hand out bulletins and pay checks and in which to receive reports and records. In a minimum sense it must do these things well, and therefore should be conveniently located. This outer office, or secretarial function, should be so situated that it will be a successful service place, conveniently located, conspicuous, with all the obvious utilitarian virtues. In its greater function—that of leadership, guidance and a place of referral—it should be a pleasant place, a place for an appropriate conversation with Johnny, who has already appeared from time to time on these pages, on the day when he has gotten into trouble, and it may be the principal's job to find out that the reason he was bad that day was because the puppy dog he got for Christmas was sick and had to be put away, and not because he was trying to be smarty or bad. In turn, it should be a place where the principal could discuss calmly and with wisdom whether it was better for Mary's

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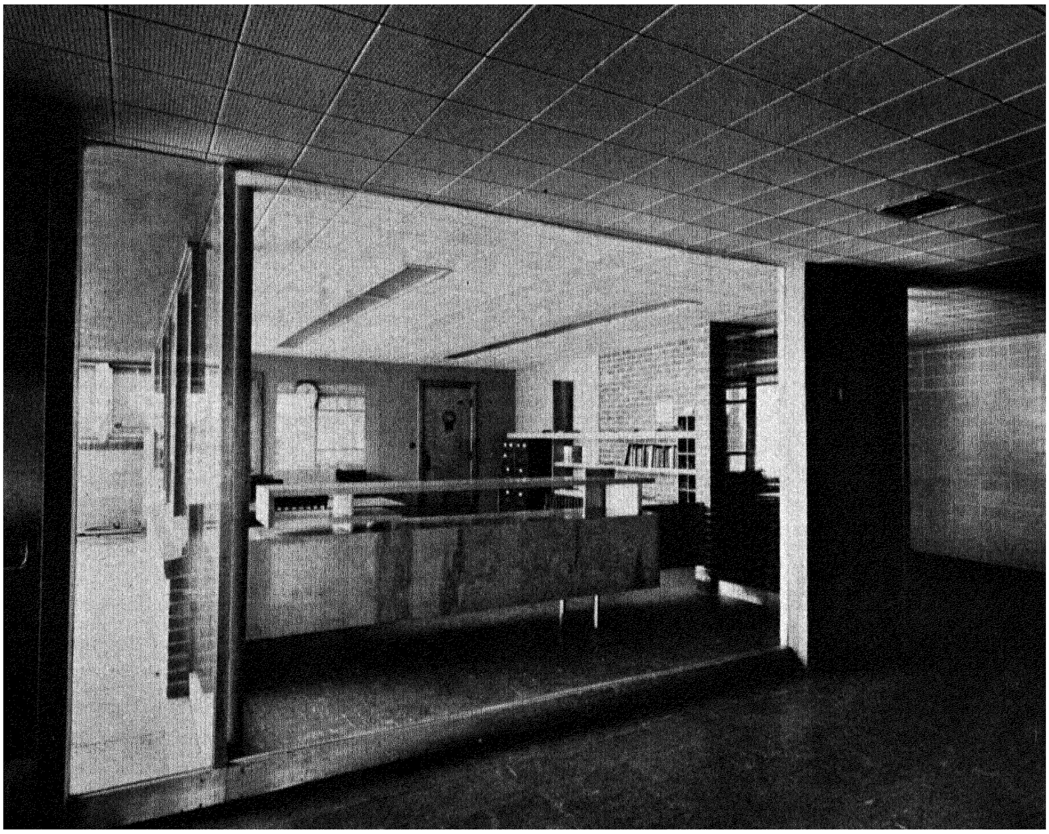
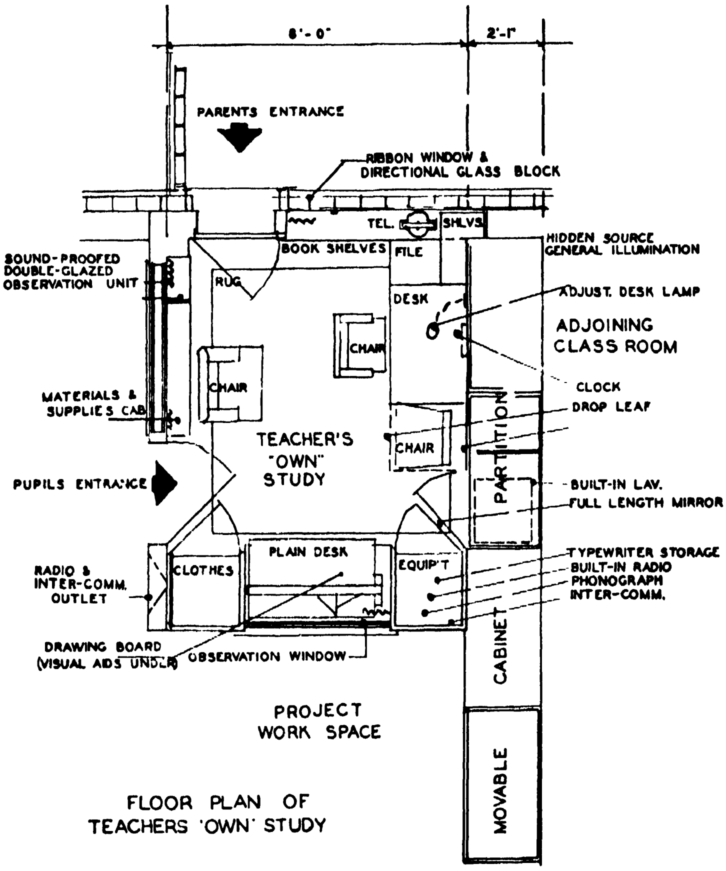
* *School Management, June 1948. Condensed from the Bulletin of School Library Association of California.*

Principal's outer office in Crow Island School, Winnetka, Ill. Eliel Saarinen-Eero Saarinen and Perkins, Wheeler & Will architects. Hedrich-Blessing photo.

The principal need not work in hidden seclusion. He may feel more a part of school life in an office like this one at the Greenwood School, Waukegan, Ill. Ganster & Hennighausen architects. Chicago Architectural Photographing Co. photo.





Today's classroom is home to the children and to the teacher. Here the teacher has a place to work, to talk with parents and children, to keep her things, as part of but not in the classroom. Ganster & Henninghausen architects.

family to take her out of school for a month for a long dreamed of trip and what the compensating advantages are to offset the laws of routine progress.

All this, by implication, describes a nice room—not a cold business office, but a friendly, personal-scaled, almost living room-scaled type of office, with pictures and wall paper and furniture, comfortable enough and cheerful enough to create an atmosphere of exchange of ideas and easy confidence. The outer office can be made sanitary looking, if it's absolutely necessary, but this is probably a bad idea, too. In any case, the whole function of this department is offset and sometimes defeated by too precise and cold and formidable an atmosphere.

In the Greenwood School in Waukegan the office is a glazed off portion of the main reception hall, and many pluses have been claimed for the accessibility and personalizing effect of having the principal's desk as a visible part of the daily life of every student in school, and he himself as a daily contact rather than a remote Tibetan judge.

Guidance

Whether guidance is an extension of administration and whether it belongs in the physical plan with the administrative center where records are kept and where the principal and the clerical staff may be located in the larger schools, is controversial, but we think it is part of the true administrative function.

The architectural expression of a room for guidance is actually a pleasant place where a dean of boys or a dean of girls or a psychologist or whatever type of person finds his way into this job can work in convenience—in less than formidable surroundings. In short, it's an office, but a nice one, where people sit around a table rather than back of a desk.

Teachers' Room

There is one room which is not generally considered a part of administration, but in a highest sense it is the principal instrument, in terms of physical plant, of democratic administration. It is the teachers' room . . . not the so-called rest or retiring room but a teachers' room which, if well done and well handled, is the heart of a democratically run school. It is their living room, their place of gathering, perhaps for lunch with a kitchen adjoining it, perhaps for a teachers' meeting with plenty of ash trays and easy chairs, and in general, a pleasant place where they can sit and act like human beings and

talk calmly and away from the press of traffic about what can be done about Richard, who cannot be made to see the use of arithmetic, or what really is the application of some of this high-flown hand-me-down stuff about democracy. With a kitchen adjoining this room, it's possible for the teachers to club together and maintain the services of somebody who will get lunch and clean it up so that the warming experience of eating together without the nagging necessity of dishes can be a means of sharing ideas and developing the rapport and unity of purpose necessary to run a good school.

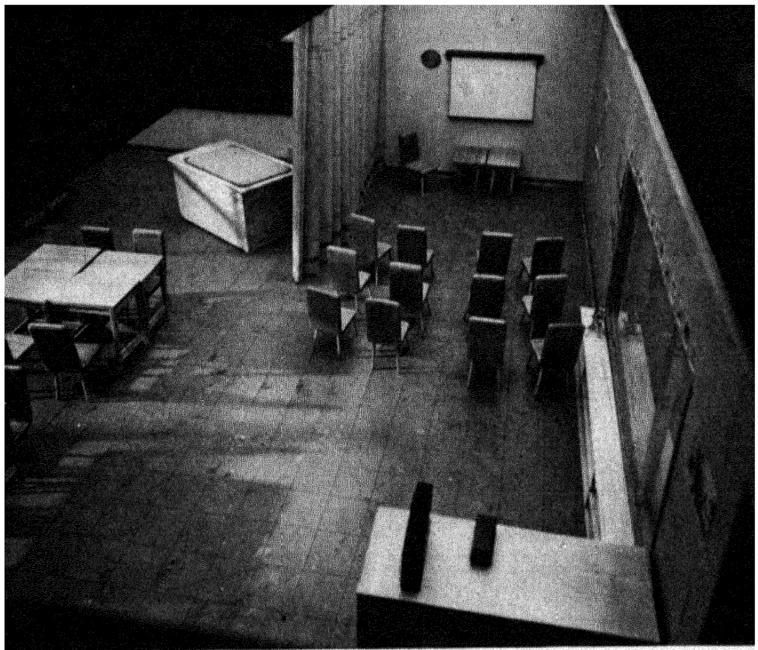
This room must have bright colors and cheerful curtains and rugs and floor lamps, and it must not have the usual six ceiling light fixtures which label a classroom converted to this purpose. The adjoining kitchen, if there is one, must be designed so that when it is not in use it does not obtrude its shiny, utilitarian services into what is otherwise a place for warm, human relationships at the "idea" level.

Visual-Aids Rooms

Visual aids have graduated. They are now "multi-sensory aids to education," and at least from the title we must assume that the student is to be assaulted in all his senses with bells and smells and whistles and thistles. This is a long way from the 16mm home movie from which so much was expected.

Actually this category of teaching aids includes far more than the limited concept of a projector with some 35mm Kodachromes or even a 16mm movie to be used in connection with classwork. This actually touches the whole broad field of devices for imparting subject matter and experience between the area of direct experience and the area of abstractions, such as reading material in a book. It includes radio and recordings, slidefilms, filmstrips, motion pictures, and much more; it includes posters and collections of illustrations, rock collections, butterfly collections and the like. In short, the provision for visual aids, whether it be in the individual classrooms or, to some degree, in centralized facilities, is to take care of the functions of a little theater and a living museum—living in the sense that it is a changing place where children can see and touch and make things and share in the creation of exhibits.

Since one book cannot cover all the possibilities of every kind of every room, we will illustrate from one building in Winnetka the housing of visual aids in this broader



The classroom—traditional or modern—can double as a visual aids room. Perkins & Will architects. Courtesy *See and Hear.*

sense. The principally significant thing about the room is the creative spirit that went into its programming although the tangible outcome is also very satisfying. "Multi-sensory aids to education" in this case called for a room, the central area of which was used for movable seating for fifty students or less to look at projected material on a screen. At their back was a wall devoted to deep closet space for the garaging of all the projectors and similar equipment for all purposes in the entire building. Whichever kind was appropriate was brought forth and put on a counter at the back of the room, and a screen pulled down from a ceiling pocket for this purpose. When the screen is up, this end of the room is devoted to more cupboards where an increasingly formidable slide and poster library is being accumulated. In adjoining storage rooms are found shelves for the organized storage of the loot from various teachers' sabbatical trips abroad. In this category are included posters, Chinese shadow play puppets, Swiss wood carvings and other similar memorabilia collected from the attics of well traveled parents.

To return to the room itself, the ceiling is a fiber acoustical ceiling with homemade light fixtures consisting of glass hung below recesses which contain the light bulb. The floor is just a floor with asphalt tile surface, but the side walls are what really matter. There are cases, shelves and a series of varied sized blocks, all surfaced with burlap, which can be piled in an unlimited variety of forms as a background to exhibit the materials which can be brought out of storage from the other rooms or brought in on special occasions. Lights in the ceiling along these walls pour down on these exhibit walls so that when they are switched on the museum-like character of the room is dominant. When they are switched off and the chairs suitably arranged, it is a room to show slides or movies pure and simple. Of course there are electric outlets at suitable places, but it is not a static, sterile lecture room in the accustomed sense. It is not even a multi-purpose room in that it has the single purpose of expanding students' experience by the use of "multi-sensory aids."

The controversy of the relative merits of being able to use projected materials in class-rooms versus the merits of a centralized visual-aids room, in other words a projection auditorium, have been touched upon in Technical Aspects. It was suggested there that either could be well done, but here we further suggest that if the decision is to have a centralized room, then its potentialities, far beyond merely a place to sit and see and look at a screen, should be explored and exploited.

CHAPTER 4: Large Group Spaces

The auditorium is a vehicle for developing group skills. In a sense so is the band rehearsal room. So is the cafeteria. The corridor, too. Students of all ages learn here. Personalities interact and the art and science of getting along with one another develops. In a crowded corridor people learn by experience that keeping to the right and dodging the other fellow with a modicum of good manners is one of the quickest ways of getting to the other end. This is a low grade of idealism perhaps, but still one worth learning. And it illustrates concretely a function of these large group spaces. They have other functions. Again we come back to the educational planners for guidance. What functions does this philosophy, this program, emphasize?

There are several approaches to student assemblies, and each has its architectural expression. Let's test a few. Suppose that the student body to be served is huge—say five thousand—and the auditorium is to bring them all together at once. The purpose behind this is to demonstrate the unity of the student body, its mass and strength. It is to expose them to visiting celebrities and other festivities under conditions of maximum "efficiency." This efficiency guarantees reaching the most students with the least effort on the part of program committees and others.

The architectural expression of this formula is an enormous barn. Seats stretch back as far as the eye can see—farther if the lighting is poor. Sight lines are violated, probably. The human voice is amplified and magnified mechanically so that the remote dot which purports to be a human being on the distant stage will be able to reach the minds and consciousness of each student nearly as well as if they'd stayed home and listened to the radio—much more poorly than on television where at least the camera is close. Bigness in this degree and the presentation of a human personality are two ideas that are in complete conflict. Human scale and five thousand seats just do not go together. Such an auditorium forces the program bill of fare into certain narrow channels. A series of trained orators, extraordinary musicians or groups of musicians, pageantry instead of dramatic art. The lighter programs, the more delicate shadings of personality do not have a chance in such a barn. Let those who have attended sessions in the Atlantic City Coliseum testify.

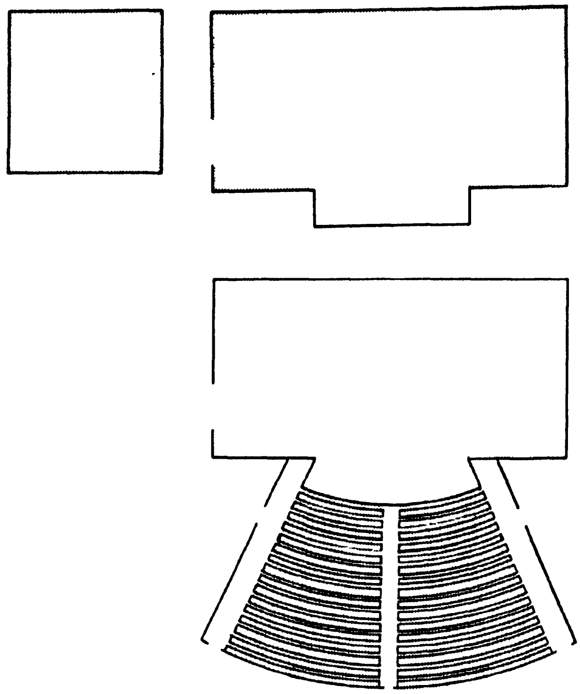
If that is the purpose of the auditorium: merely to transmit information from a speaker, sound from a large musical group,

with maximum efficiency, then a public address system or a radio can do it better and cheaper; television sensationally so.

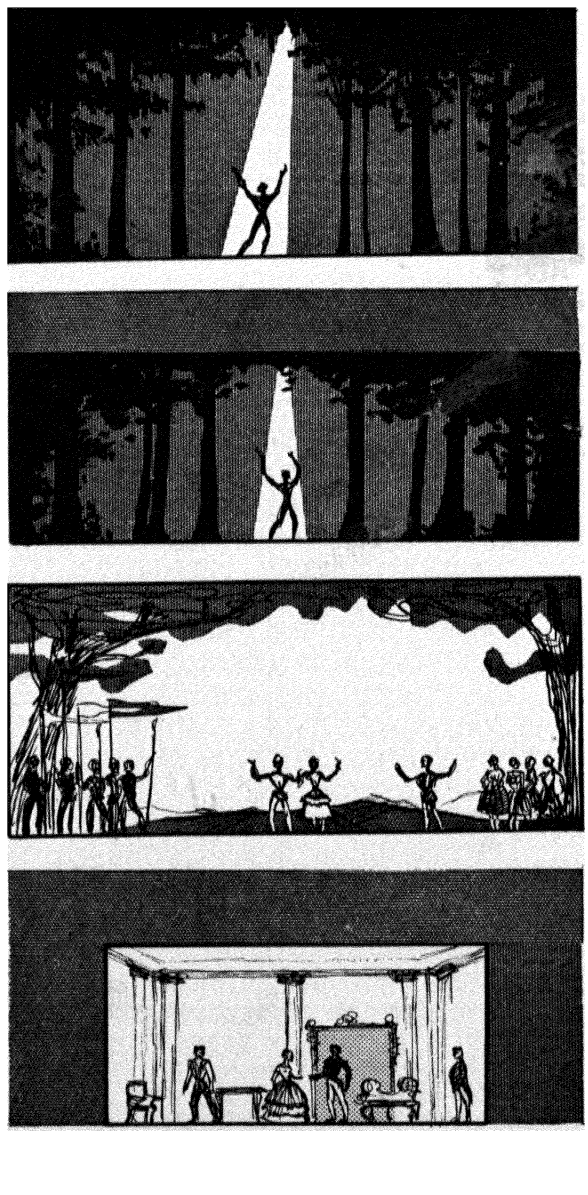
Let's take an alternate premise, still with the huge student body above. Suppose a program is designed to impart the human values which can be offered by visiting personalities such as Alice Marble, the tennis champion, or Cornelia Otis Skinner, or other people less overwhelmingly dynamic than a William Jennings Bryan. Suppose programs by local soloists and string groups, the high school orchestra itself. A dramatic program to include plays like "Androcles and the Lion," in contrast to "The Front Page" as a noisy production; or the inevitable "Pinafore" with its oversized chorus to make up for the light voices of teen-agers. If these are the premises around which the auditorium is to be designed it automatically is limited in size. One educator of renown believes that 1800 is the limit for projection of the personality of a natural person. He cites having invited Miss Marble to appear. Her value to the students, he says, is fully as much in what she is as in what she says, and this would be stifled if not extinguished before the whole student body at one sitting. She would become a different person under the pressures of the huge crowd and the mechanics of amplifiers. It is our belief that this educator is too generous in setting the number as high as 1800 for this kind of program.

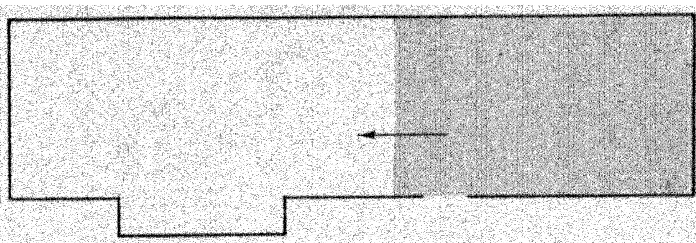
All of us have heard statesmen and other celebrities speak before huge conventions. Does anyone feel he knows any more about that person than he might have learned by reading the speech, or hearing it on the radio? The inevitable conclusion and its meaning for space planning dictate a relatively small auditorium and the limiting of mass functions to those which can be done either outdoors or in the gymnasium, fieldhouse or the like.

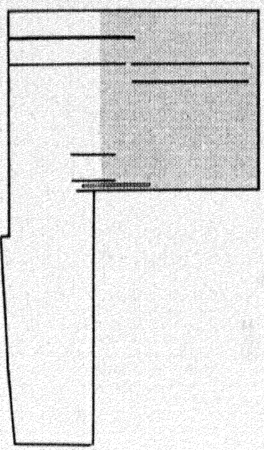
Now to apply this to the design of a particular room. The desire to produce "Pinafore" for the delight of the participants and their friends commits the design to a stage which will accommodate a chorus, where scenery can be changed, and where that chorus can pass back of the stage so that it can disappear on the right and reappear on the left without telltale bumps and wiggles in the cyclorama. In most school stages the change of scenery is handled better by wide wings on either side of the stage, rather than a high fly-gallery which presumes the quick changing of the same scenery night after night. Everyone expects amateur stage hands to take more time and to make some mistakes.

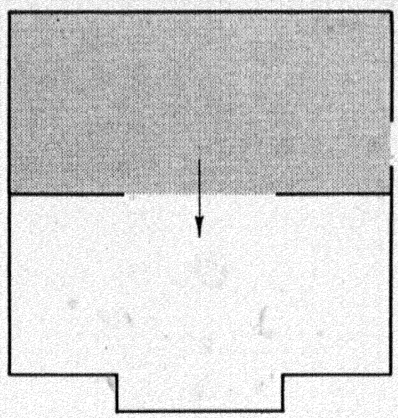


A theater-auditorium that is truly designed by its functions. Represented here by shaded areas are four of the essential elements of the theatre. Upper left, an acting area. Above, the working space. Directly above the audience seating. At right, a section showing the loft or fly gallery.

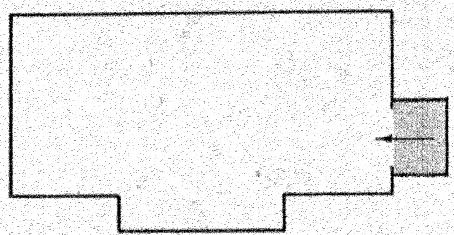




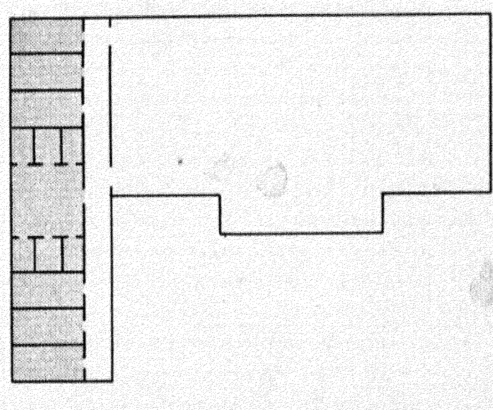


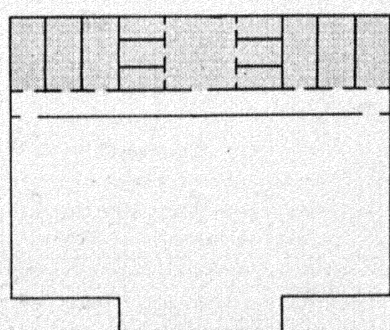


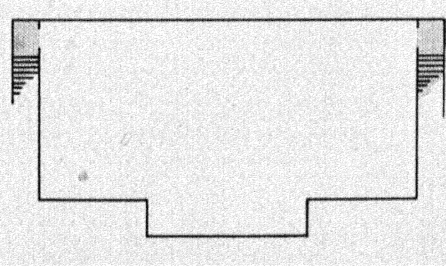
The work shop may be adjacent to the stage as shown above, directly behind the stage or may be a remote location in which case there must be a loading dock or elevator. If the shop area is directly behind the acting area, easy rolling fire doors with acoustical properties should be used.

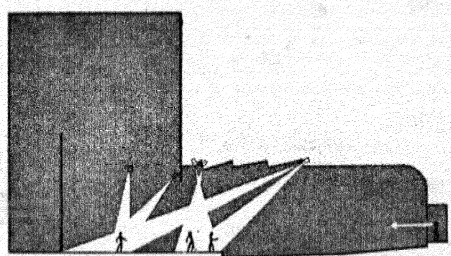


Dressing rooms may flank the stage, be directly behind it or above or below the stage level.

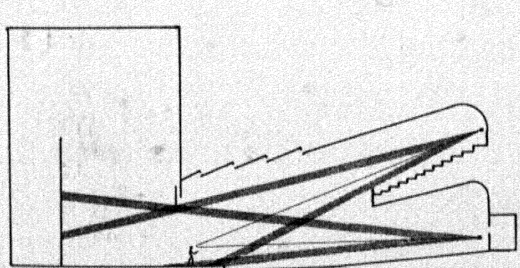




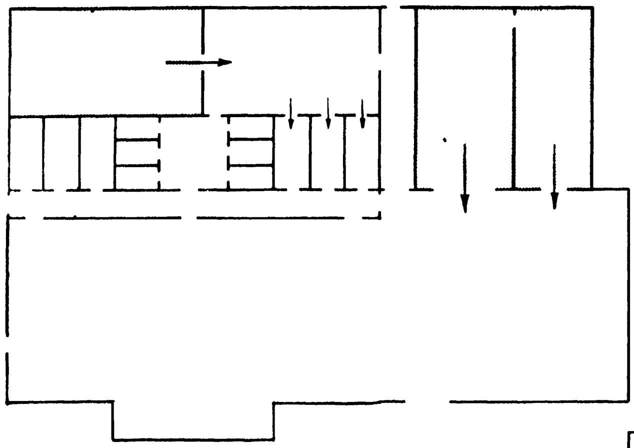


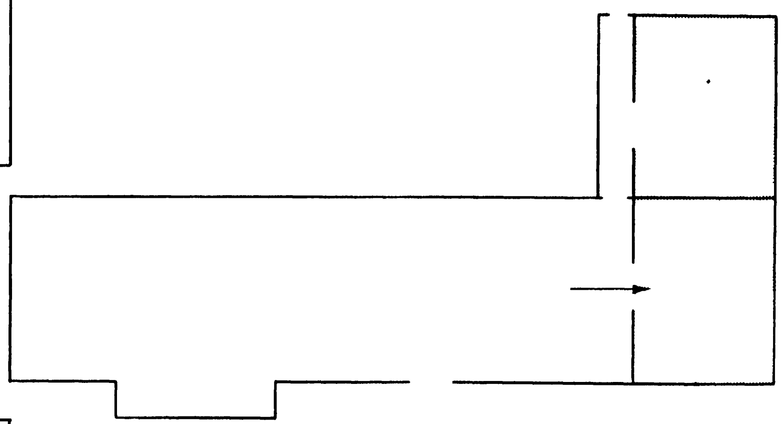


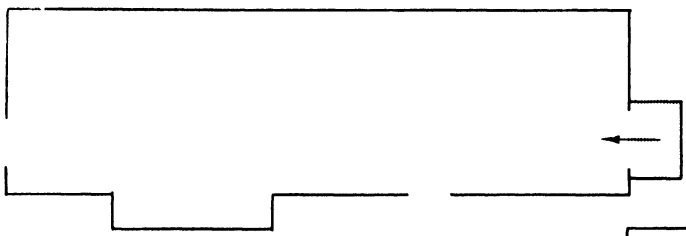
Esthetic considerations demand flexibility of the proscenium opening. The relationship of man to his environment may be expressed by sheer height. Teasers or tormentors may be used to create a false proscenium. Directly above are beam lights shown lighting the much neglected forestage with a relatively short throw. Below, sight lines are complicated by balcony. The man in the balcony gets a distorted view of the stage.

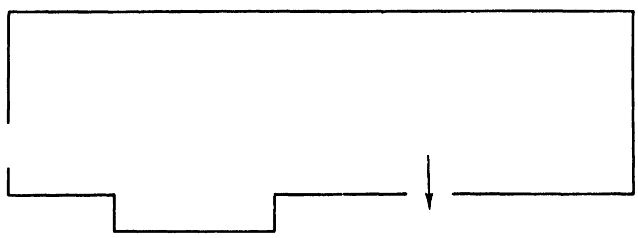


Storage is the forgotten space—until the theatre begins to operate. Shown here are various possibilities of the location of storage space.

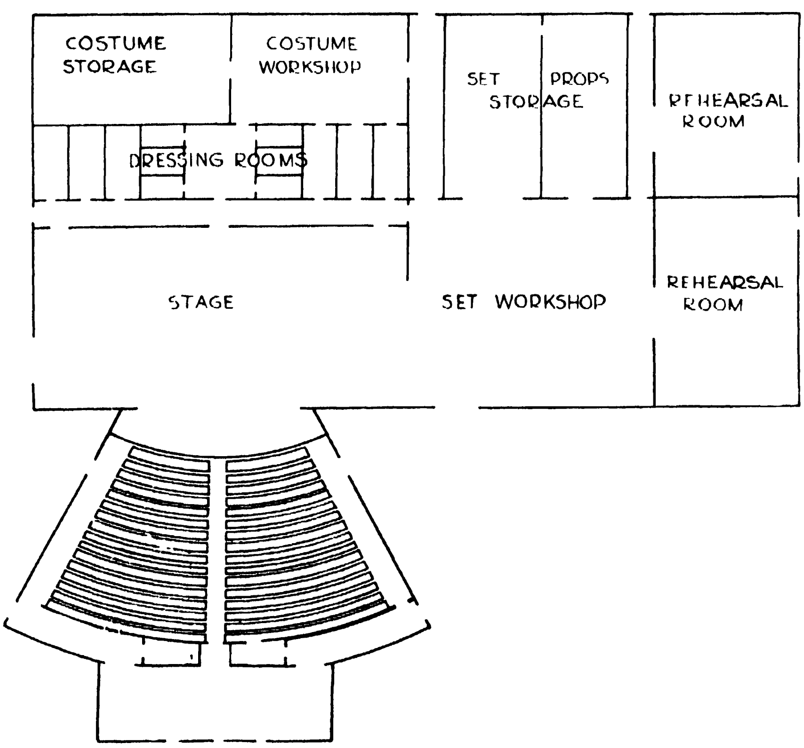


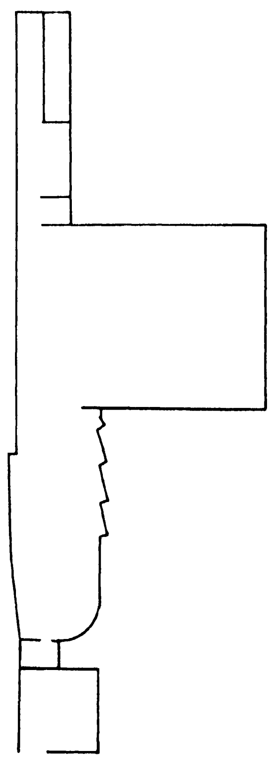


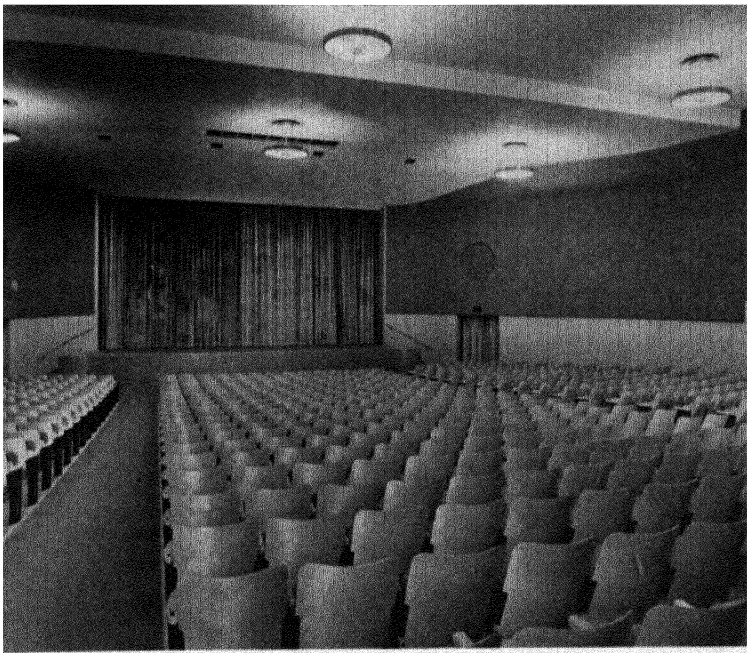




Here in sections are all the elements which are essential for good theatre production. Material on pages 90, 91 and 92 from Edward Hearn, John Jones (artist), and Jack Morrison, Theater Arts Department, University of California at Los Angeles. Courtesy *The American School and University*.

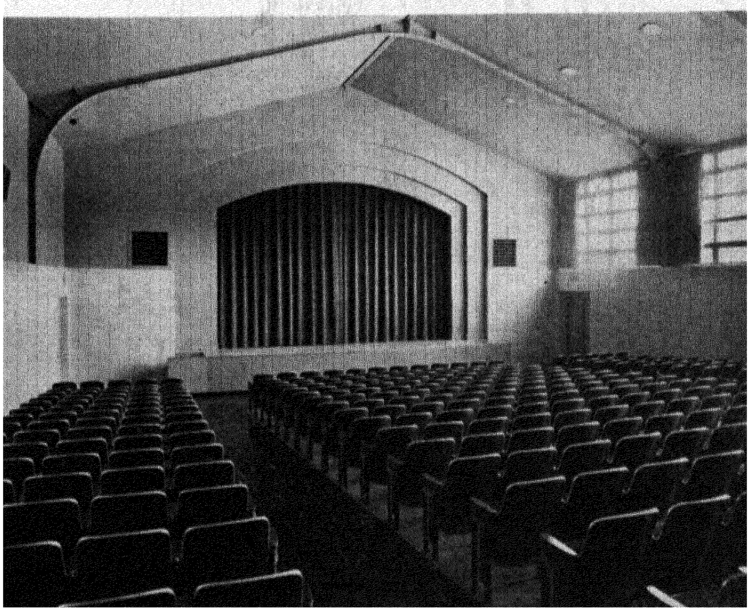






Seven or eight hundred people can have an auditorium experience in the Ralph Waldo Emerson Junior High School auditorium designed by Neutra. Julius Shulman photo.

A child-scaled auditorium of simple design.

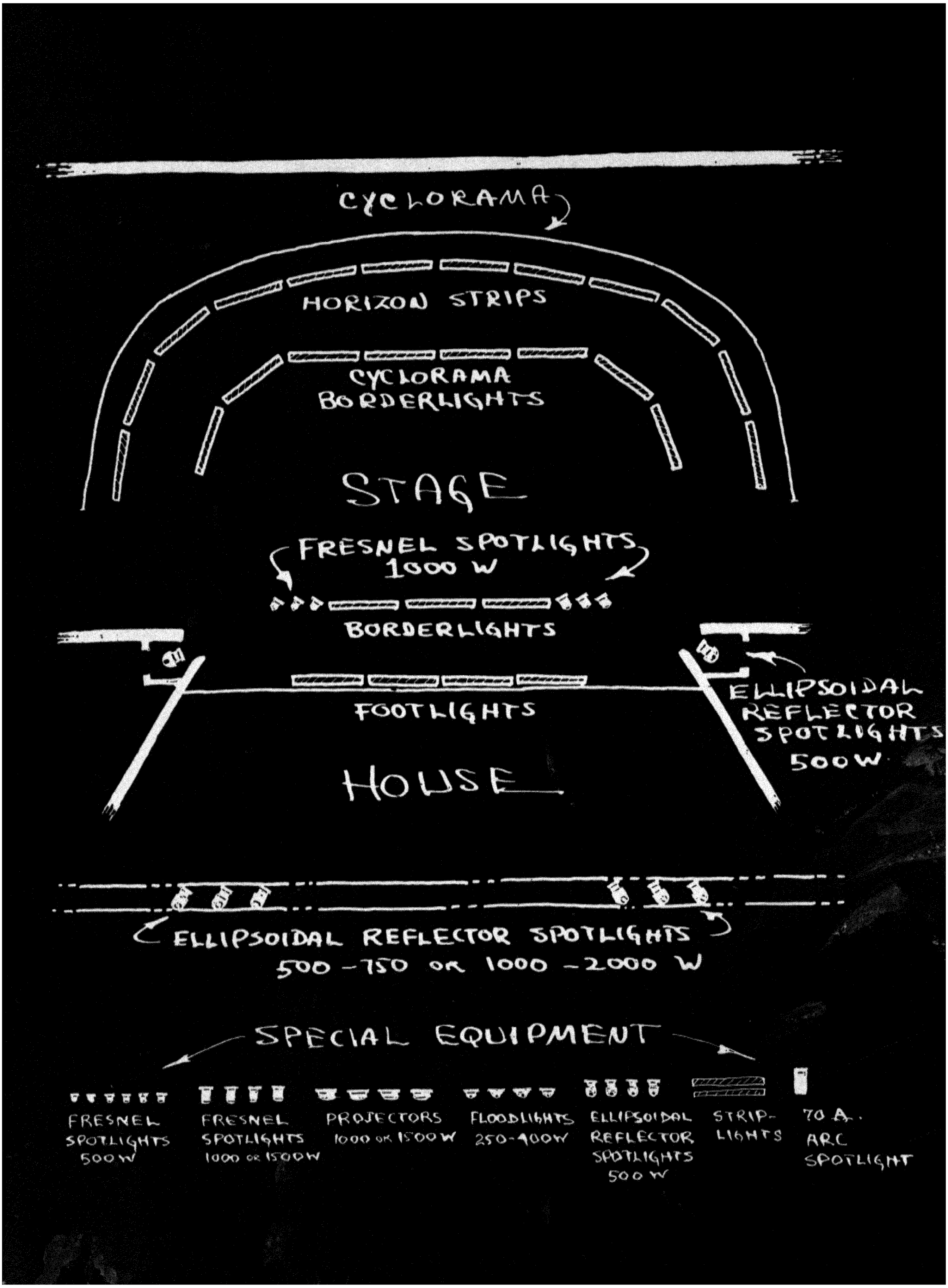


The sound of their hammers coming through the curtains between acts is part of the entertainment. Plan wisely, then. About as much space is needed on each side of the proscenium as is included within it. This space should give access to and preferably adjoin the shops. Scenery is built, not usually on the stage itself. This also has implications for the height of door openings from stage to shop. The back wall of the stage or the cyclorama should be a very hard reflecting surface—it must reflect voices and lend itself to good lighting effects.

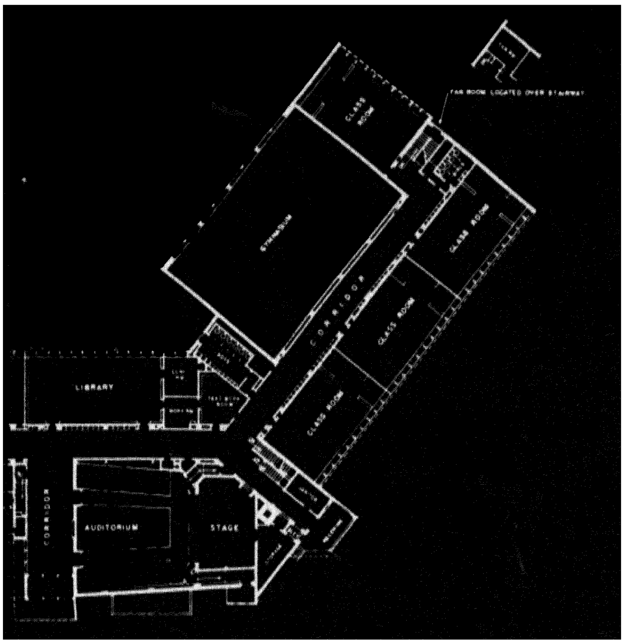
This stage lighting is a story in itself. Some words of caution. Provision for elaborate controls are most cheaply made when building. Lighting must be designed for good control by students. Footlights are diminishing in importance. Some flood and spotlighting must come from in front and above, in all likelihood. Stage lighting does not stop at the proscenium. Stage front and the orchestra need light after house lights are dimmed. But back to our operetta.

"Pinafore" requires an orchestra. They cannot be on the stage because that's where the actors are. An orchestra pit conceals them from view, and their recognition in the show is a part of the total effect. Parents have to see Johnny as well as hear the few audible notes of his trombone solo. In plan, this may mean that the front seats of the auditorium will be on a flat part of the floor and be removable—probably best handled by folding seats which are set up only when the full audience capacity of the room is required. Admiral Sir Joseph Porter's bass has not yet matured, and he has no chance of reaching the back row of a room larger than a thousand when he announces that he is "the ruler of the Queen's Navee." He has put a limit on the size of the room. If he has to sing to 3,000 people, let him do it in three nights. The second and third performances will probably be better anyway. Every possible device of acoustical aid, short of electrical amplification, will have to be employed to keep his voice and his personality as natural as his limited acting skill will permit.

But you cannot just build for light opera. An auditorium is a place in which to make a speech. No part of our country is remote from speech makers on many subjects. The nearby college can supply a lecture series on Milton, and the local architect is dying to be asked to talk on "Why Modern?" Each has a light style of presentation and wants as little sense of separation from the audience as possible. He wants them gathered about him, and he wants to be anywhere except in



Basic layout of lighting instruments from page 156 of *Theatres and Auditoriums* by Harold Burris-Cole and Edward C. Cole, published by Reinhold Publishing Corp.



The gymnasium can become a large auditorium with the adjoining classroom for the stage when the smaller auditorium just isn't big enough.

A narrow, windowless auditorium with pitched floor and angled ceilings. The blocks making up the stage apron are removable and may be set in various combinations. Perkins & Will architects. Hedrich-Blessing photo.

the center and back of a stage. This is the reason for the speaker's promontory at one side of the stage in many auditoriums. The corollary of a semicircular seating plan so that the audience could enjoy him and each other is unbuildable because it conflicts and must be compromised.

It conflicts with moving pictures and slides, for instance. The essential condition of a good room in which to see pictures on a screen is a function of sight lines and a relatively narrow angle of vision. Be they "visual aids" or "movies" they impose further conditions: complete darkness when desired; and controlled conditions of light and ventilation. This is the point at which the windows come out of the plan for the auditorium. But won't this make the room gloomy and unpleasant? When did you go to the movies last?

Another factor which puts a condition on the auditorium is commencement. Here all the doting parents and all the impressionable younger brothers and sisters expect to see the entire graduating class—or anyway one member of it—in its ceremonial departure from the ivy covered halls. It won't work. Don't try it. If you build a room that will do that job, the others will be done badly in a big half-empty room. Fix up the gym or go outdoors when this one day a year function is upon you.

Let us summarize the effect that these factors have on a room for group experience. You will have—

A relatively *narrow room.* Sight lines and movies have prevailed here.

A *windowless room.* Windows and uncontrolled light help almost nothing that goes on here and actively hurt more. Corollary to this decision is a good job of lighting and ventilation.

An area of *removable seats* at the front of the room and a stage apron made of blocks which can be set in the usual bluff division between stage and audience or rearranged in steps for glee clubs and for easy transition from audience to stage.

A *stage* with place to handle scenery at the sides and a place to pass across at the back. The stage sized and the proscenium scaled to the scenemaking ability of students.

A *pitched floor.* Flat floors fail.

Walls and ceilings angled to implement acoustics and lighting.

And a final factor—budget—will resolve these foregoing ones into a beautiful room. There will be no decoration. People are the

most interesting things in any room, and they are colorful. Cornices and murals detract from the things the room is to do. The forms dictated by lighting and acoustics will be interesting and satisfying. The finish materials will be those from which the building is constructed. It is a far higher design achievement to use humble natural materials so well that they may show than to rely on a prettifying veneer to create illusion.

To repeat—the foregoing was a sample, an exercise in design approach, taking factors and moving through them to a physical plan. These factors will always vary, and it is to be hoped that each auditorium will show it.

We have purposely deferred writing about the auditorium-gymnasium combination until the functions that an auditorium can perform had been outlined. It must be obvious that many of these run head on into the requirements of a gymnasium.

Basketball is difficult to play on a sloped floor.

Physical education is coming to require some time from nearly every student every day.

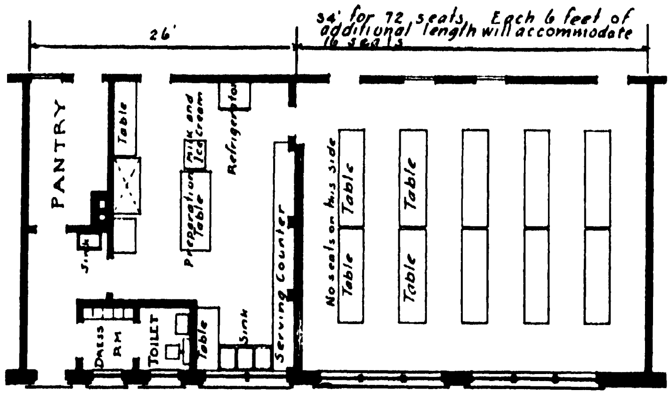
Dramatic rehearsals do not mix well with games and exercises. *And so on.* It's a long list.

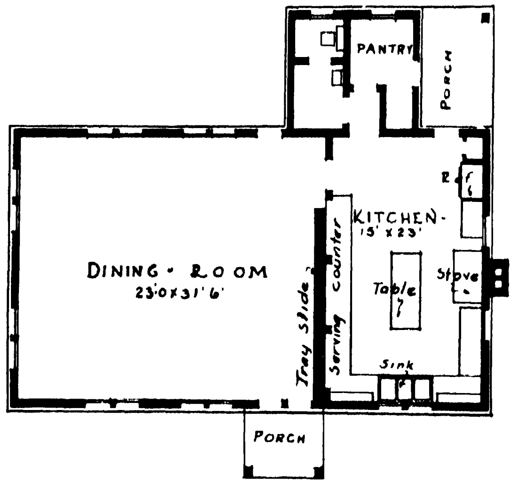
We recommend that if the budget dictates a compromise, it be made in the direction of a smaller auditorium with less lavish provisions. This is our book, and we state categorically that auditorium-gymnasium combinations should be strenuously avoided in all schools. Let him also write a book who wants to argue that such mutually exclusive functions can be mingled.

Lunchrooms

The lunchroom serves many more functions than merely feeding the inner man. It must do this well, of course. But even at the service level would-be restaurateurs all over the land have found that there's more to it than just that. This space is included in this chapter because of those other functions. In some philosophy it is a centrally socializing space. It serves nutrition, education and practical group living alike. Some philosophies look on it as a further equalization of opportunity for healthy bodies and vigorous minds. Still others point silently to the very sound social basis for plain good manners. Certainly in the school ages it is more than a service function.

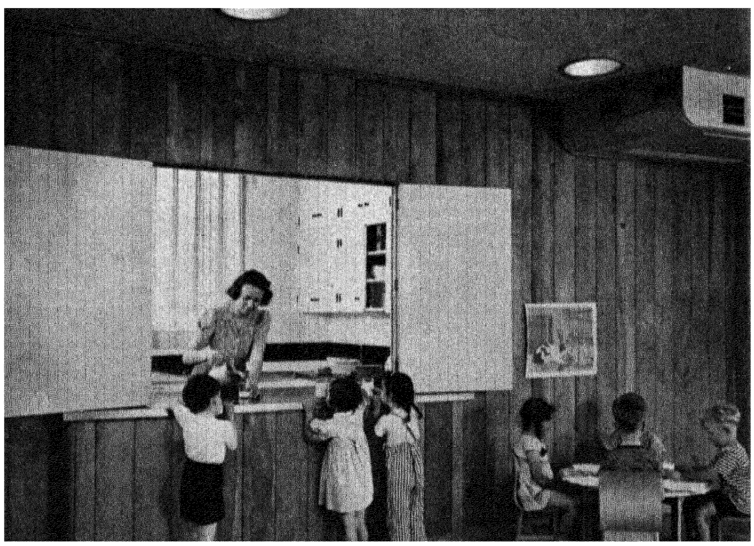
The range of architectural expression of these functions is tremendous. Even where it has no place in the educational program

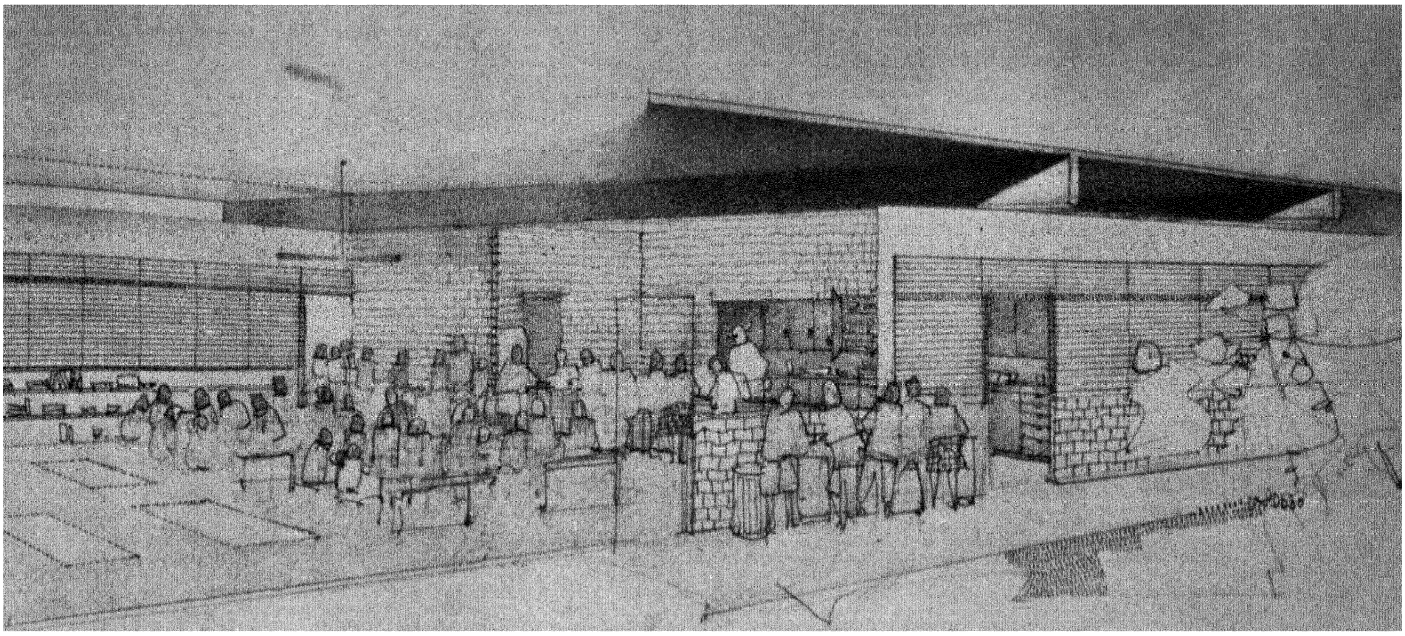




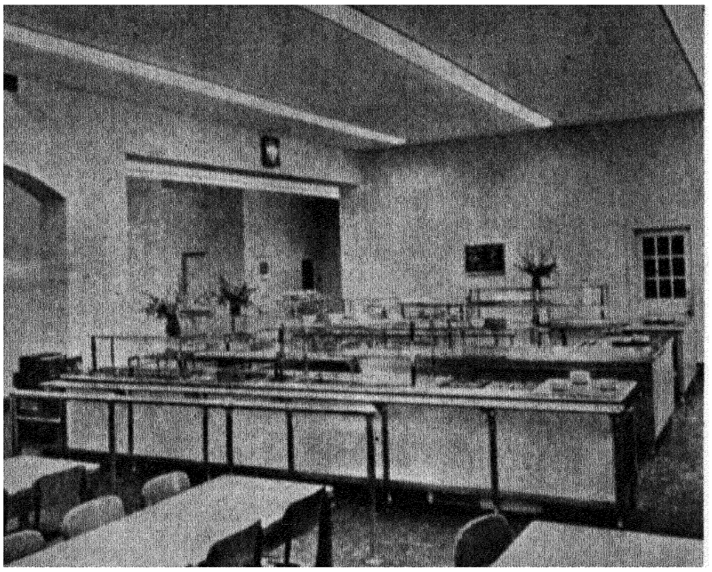
The school lunchroom needs a special kind of space. A separate building planned by the Interstate Building Service. Courtesy *The American School and University.*

Kindergarteners need a special kind of lunch service. Mamas and dads can use this one for small evening meetings. Crow Island School, Winnetka, Ill. Eliel Saarinen, Eero Saarinen, Perkins, Wheeler & Will architects. Hedrich-Blessing photo.

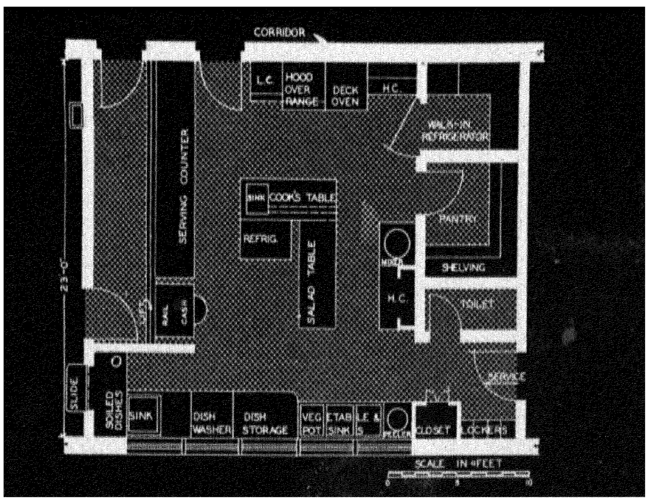




Outdoor counter supplements indoor lunchroom in plan for Puerto Rico. Richard J. Neutra architect.



Cafeteria serving counters in Central High School, Newark, N. J. It can be placed in a separate room thus leaving space for other uses. Courtesy *The American School and University.*



A kitchen designed by the State Education Department in New York to serve 500 children in a school lunchroom.

itself the challenge is to make orderly and decent eating possible. And even here, as we shall suggest later, there is the ever-present consideration of making this space valuable to the community in hours when the school cannot use it. The choices are still wide—from mass feeding techniques to intimate family-size tables. It won't be the budget that determines where it comes on this scale. It should be the planners again—school and community. Plus the creative ability of the designer.

A detail toward the intangible success of the lunchroom is the ability to separate the kitchen and serving line completely and visually from the dining room. This is most easily done by having the serving line in a separate space entered by one door and left by another. Thus by closing two doors the noises and the sanitary looking chrome are excluded from the atmosphere of a room which can have many alternate uses.

Time honored among these is its use as a study hall. The tables and chairs are there, and the only additional requirement is adequate study lighting. The degree to which this is workable depends primarily on how many shifts the food service function must handle. In this connection it is seldom wise to design a lunch facility to handle an entire student body. Two shifts are required for labor economy in the kitchen, as well as not to overbuild the equipment. A third shift is the factor for expansibility. Four shifts generally lead to disruption and compromise of other schedules and is the point at which more facilities should be planned.

Another alternate use is as a place for music rehearsal. The Acalanes High School in California by Franklin and Kump handles this problem particularly well. Instrument storage and music library are handled by a storage wall for this purpose in the dining room itself.

The dining room can enhance its own value and that of other rooms by its relationship to them. For instance, at New Trier High School in Winnetka, Illinois, the dining room adjoins the auditorium in such a way that it connects directly with the stage. It provides a logical and convenient place for tea and store cookies after the P.T.A. lecture, and it provides a wonderful place to dress and store the choruses of "Pinafore" when they are not on stage. And, of course, it is the place for parties that are not so big they must be held in the gym.

A few notes:

Trays are noisy. So are kids. An acoustical ceiling is indicated.

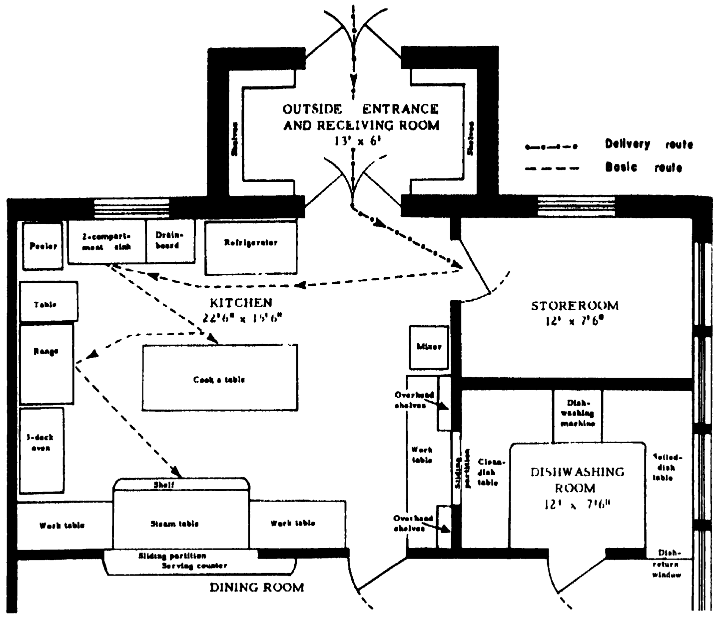
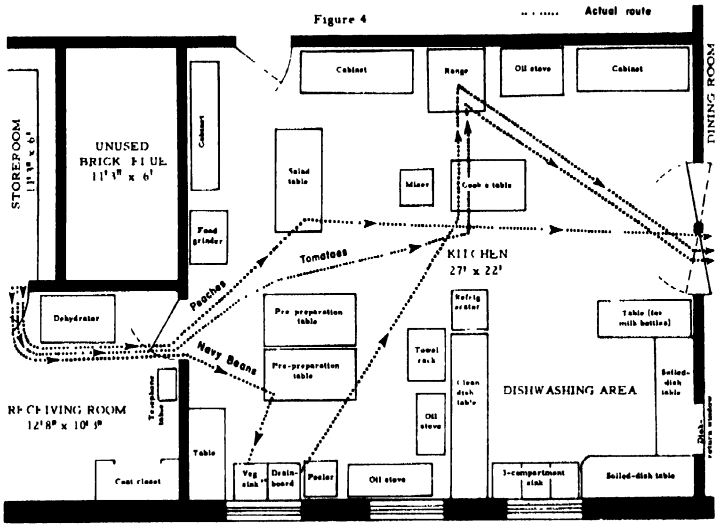
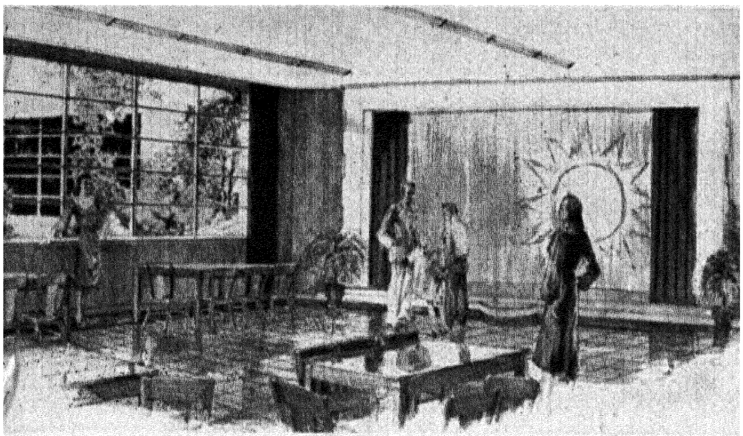


Figure 4

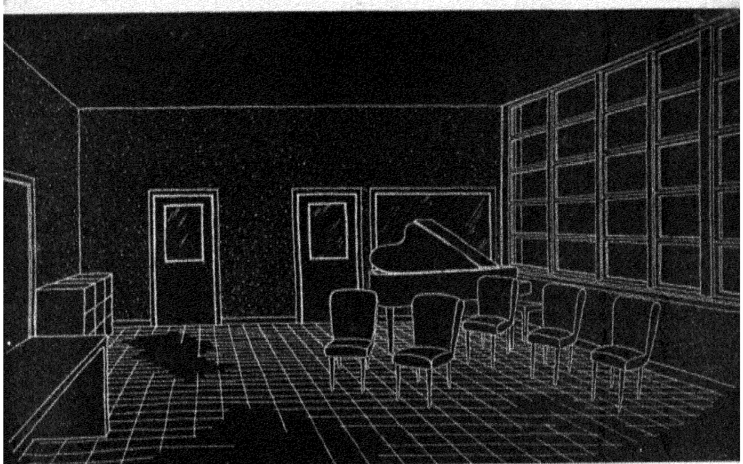


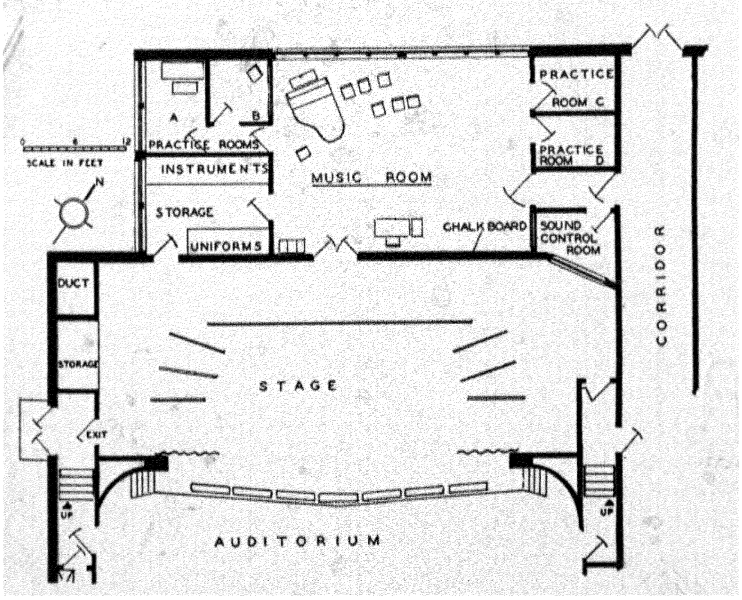
The kitchens need expert planning and some efficiency measurements. The United States Department of Agriculture bulletin PA-61 of November 1948 charts food-preparation routes.



The cafeteria may be used for school and community meetings and activities. Jay C. Van Nuys architect.

Music rooms adjoin the auditorium in natural relationship of purpose and use. Central Square Central School, N. Y. Sargent, Webster, Crenshaw & Folley architects. Courtesy *The American School and University.*





Parties require decorations. Open trusses are handy places to string streamers.

Dishes have to be washed. The return line should not have to cross the serving line.

Kitchens require specialized equipment, usually less than the salesman would like to sell you. En garde!

And in general—Here is one place where all the openness, sunlight, cheerfulness that can be brought to bear on the corporate student digestive tract and spirit is appreciated. French doors onto lawns or terraces, windows to the floor, windows toward a view are as important to the success of this room as is the chocolate sauce to ice cream.

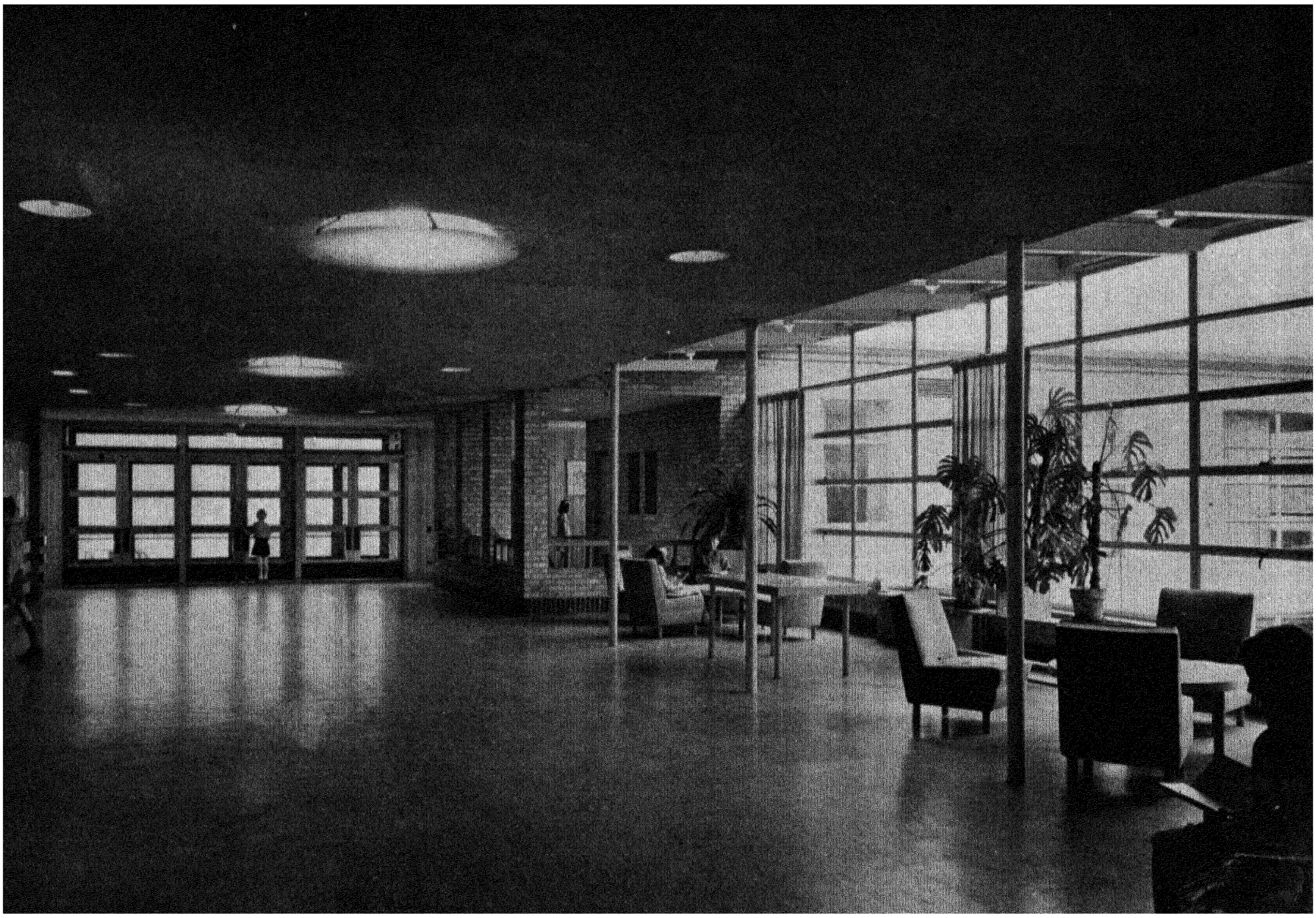
Music

Music and the facilities it demands are included among the socializing and group activities of a school. Consider the delight and experience in teamwork that comes with marching together in band, singing together in chorus, and playing together in orchestra. To get the real experience out of each of these requires workmanship, and workmanship requires tools. A good music department requires space tailored to its unique needs.

A rehearsal room (sometimes more than one) is the core of this department. Its acoustical qualities are of primary importance. It cannot be overcorrected to dampen sound and enthusiasm—it cannot go to the opposite extreme and emulate the reverberant brilliance of a bathroom shower. It should err on the stimulating side. It should be planned in variations of a semicircle so that singers or players will be facing the conductor. A series of steps within this semicircular plan should be wide enough to accommodate two players seated side by side. If the budget permits one room for chorus and one for instrumental practice, then the chorus steps should be close enough so that each row would be one step above the one in front. A combination is possible and desirable when both types are in the same room. This is accomplished by making the steps for orchestra unusually high and having a series of blocks which can be placed (or pulled out) to form an intermediate step for choral work. And this is one room where a reasonably high ceiling is really helpful. Twelve to fifteen feet is good.

In addition to rehearsal rooms music education can be implemented by several tributary facilities such as—

Practice Rooms. Small rooms 8 x 10 or 10 x 12 where one or two players can practice without inflicting pain on others. Internal acoustics are less important than mere sound



The lobby of the Crow Island School. Eliel Saarinen, Eero Saarinen, Perkins, Wheeler & Will architects. Hedrich-Blessing photo.

barriers to prevent transmission. If the room is on an outside wall and has windows (neither mandatory) point them away from the rest of the school and toward some unoffending bit of woods.

Recording Rooms. These spaces can be separated from the rehearsal room by double glass as in the engineering booth of a broadcasting studio, which indeed they may be part of the time. They can be used to record voices for speech and vocal correction, to record special events for future reference, and may well be used by small groups listening to recordings for appreciative courses. The growing possibility of integrating this department with its own F.M. outlet gives the recording room an important future.

Instrument Storage. Closets—big ones with shelves, pegs, racks at appropriate places to take bass fiddles and tubas as well as clarinets and trumpets. This should not be in the rehearsal room but in a hall or elsewhere accessible to both stage and rehearsal room without entering either. Thus the chorus can sing without the band boys tramping in and out during "Sweet and Low."

Uniform Storage. Same business. A walk-in closet—big—where uniforms can be obtained without disturbing activities.

Music Library. A very special kind of filing space is needed and should be under control of the office of this department, though not necessarily in it. Music scores are thin and repetitive and can be kept well in shallow boxes stacked flat so that each one is in effect a drawer. Visualize 100 copies of "Deep River"—sheet music plus piano score—and the limitations of normal vertical filing become apparent.

Offices. Well, the director needs a desk and a place to work, doesn't he?

A music department as a whole tends to relate to the stage and auditorium. Thus the stage becomes a supplementary part-time

rehearsal room, and public functions involving music can be carried on more smoothly. Direct access to the outdoors is also desirable since at least the band should rehearse outdoors and not have to tramp up and down stairs to do it.

All of the above has visualized a specialized department of music in a high school or junior high school. To be complete we should probably discuss the merits of pianos in elementary classrooms and the less specialized permeating of the general curriculum. Except to mention this requirement, and that pianos take space, there is no special plan requirement that has not been covered in other parts of the book.

Music is not a frill. It is a part of education in even the poorest communities. There are many things that may enhance the effectiveness of this phase of social education. We have suggested a few.

Reception Lobby

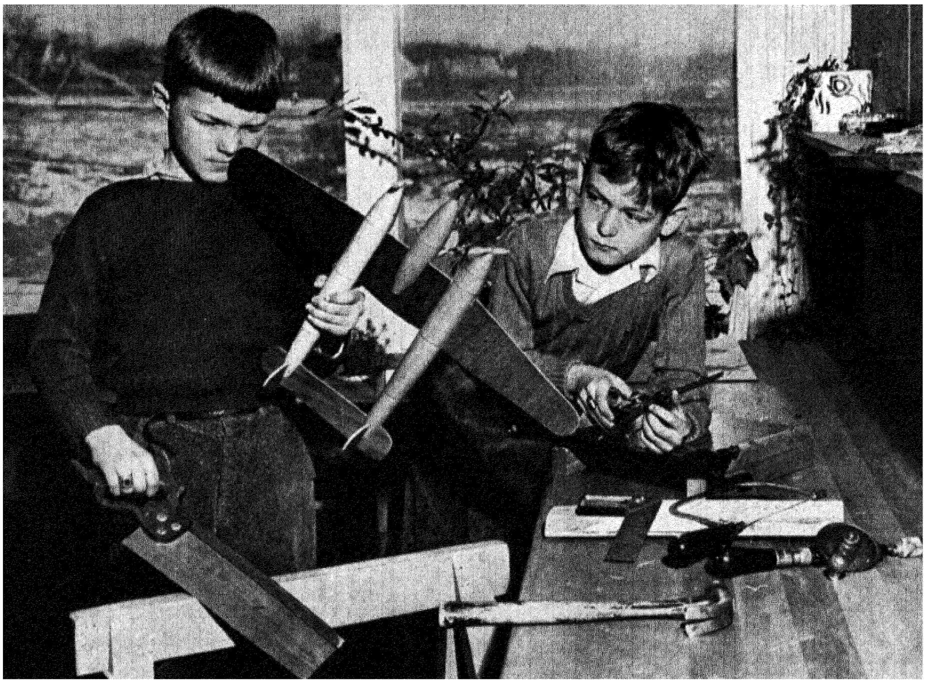
There is an unsung part of any school building that matters—matters deeply to the character, the image that students carry as a memory of school, and that is the lobby. It can be gloomy and undo the whole atmosphere of an otherwise pleasant building. On the positive side a wide central point in the circulation system of a school building with a flood of light can become the gathering point from which all other activities radiate.

In the Crow Island School, Winnetka, one bit of experience highlighted this point. Some partitions near the main entrance were omitted in the interest of economy, and the by-product was a wide space about 60 x 20 which was, in effect, the auditorium lobby and the entrance lobby. An east window forty-four feet long and ten feet high which was to have served a botanical laboratory (omitted) flooded this space with light and view. This space has become the best loved part of the building and its social affairs—the posters and exhibits for the parents' night reception—all find their way into what looked on the drawings like a wide spot in the corridor. In applying this experience on subsequent buildings, a fireplace has been included to make it indeed a place of warmth and gathering.

This is not cited to justify afterthoughts. Neither is it the treatment for this function for every school. Rather do we point out a frequently neglected function which takes planning and designing.

In this section we have tried to deal squarely with some of the problems in the large group spaces. Solutions have been suggested for some. More importantly we have called for honest analysis of function, for planning, for skillful design to give the school children and the Voceks and Bills and all the others in the community something useful in developing group skills, group participation, group growth.

Lobby, community lounge for small groups and exhibit center are a few of the many functions of this "community lounge" room in the central unit of the Clyde L. Lyon elementary school, Glenview, Ill. Perkins & Will architects. Hedrich-Blessing photo.



" . . The messages sent to keen minds through manipulation, through doing things, making things, are at least as important as words spoken or read" Rugen School, Glenview, Ill. Perkins & Will architects. Chicago Sun Copyright photo.

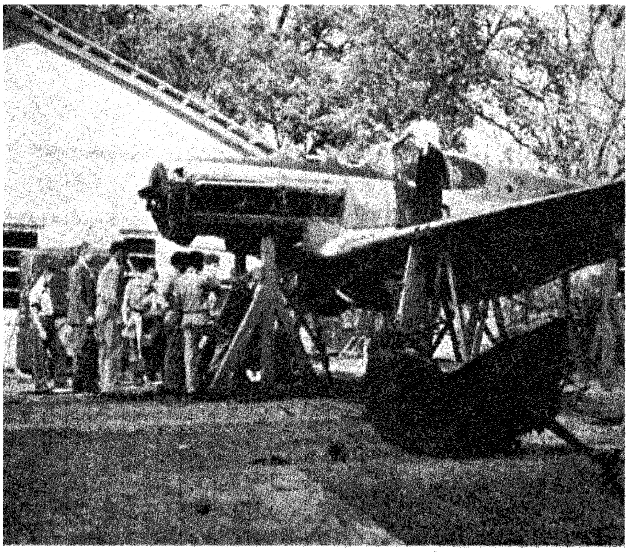
CHAPTER 5: Shops and Laboratories

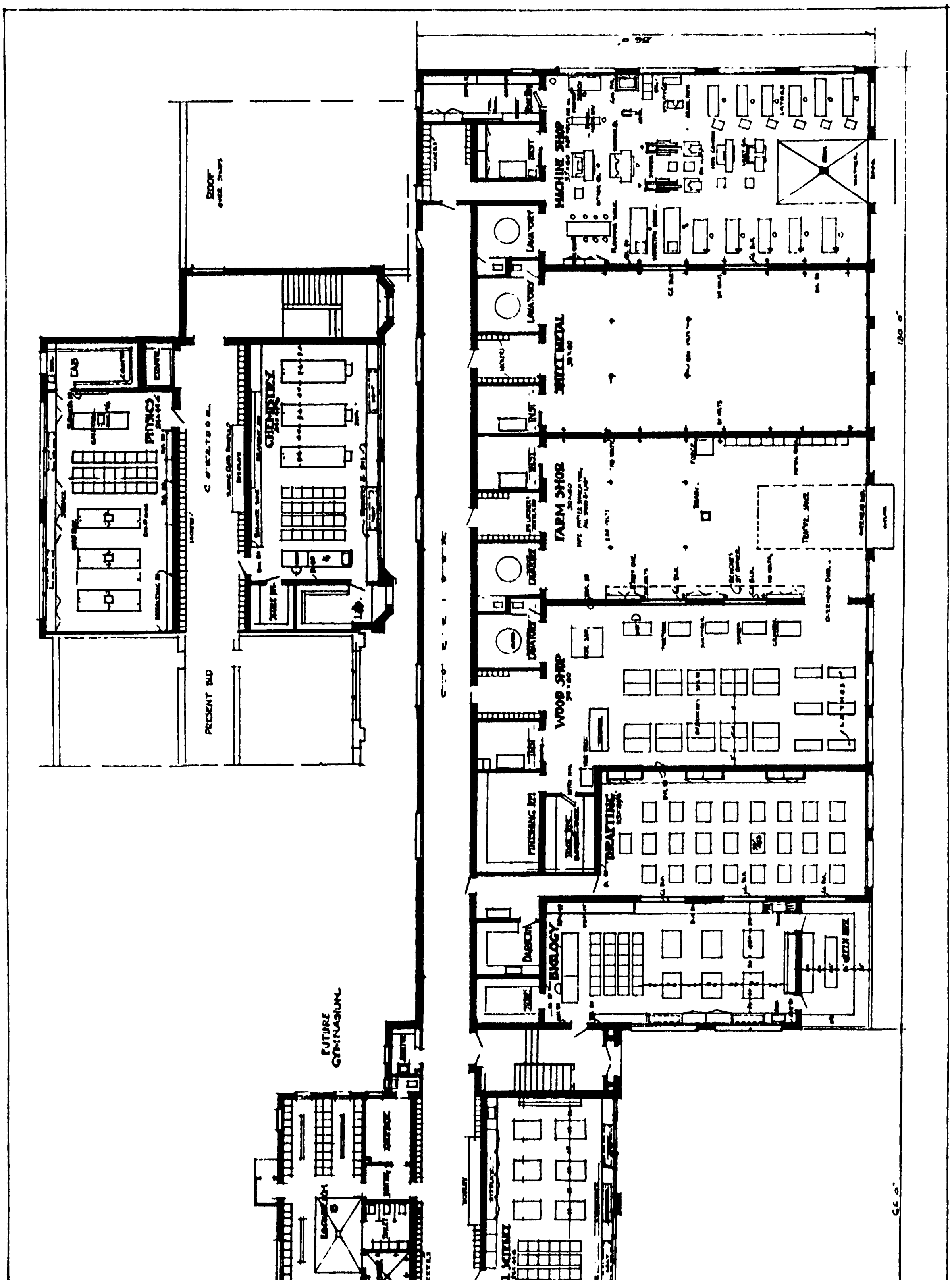
For a long time it was not thought quite respectable educationally to use the hands—except wrapped around a pen or pencil. Shops and laboratories came late in the long history of free public education. School buildings all over the country give evidence of how late. Spaces have been clumsily added to old buildings, often dug into their cellars. Newer buildings have all too often strained to fit them into the traditional repetitive classroom unit or have aped the liberal arts college facilities. They do not have very much in common with classrooms, even modern activity-housing classrooms. They challenge original planning and design.

What jobs do these spaces do? What kinds of goings-on do they have to house and facilitate? We'll not duck the question, but for now we'll just name them. Woodworking, and wood finishing, metalworking and printing are pretty general. So is homemaking of one sort or another. Certainly working with scientific principles in biology, chemistry, physics is not new. Nor are most of the activities under the arts and crafts, the hobby shops. The commercial or business jobs like typing and bookkeeping are widely included.

There are others which obviously belong in one community, one school neighborhood, and not in another. Farm shops and canneries are widespread examples. Garage or auto-repair shops, too. We shall not try to cover all of this kind. The comments on those we've listed will almost spell out what we'd say for the others.

Cows go to school, airplanes, too Radio, photography and a host of real life activities need housing in a modern school





Arlington Heights High School in Illinois plans for nine kinds of shops and laboratories besides the homemaking units. Child & Smith architects. Courtesy *The Nation's Schools.*

It's not our job to justify the activities. We're suggesting ways to house and facilitate them. But judging by the power and influence of top physical scientists at one level, the cramming and jamming of G. I.'s into our technical and engineering schools at another, these activities are no longer adjuncts. Technical and scientific skills are vital to national security, to prosperity and to an accepted standard of living for Americans today. As a matter of plain fact the caste system among curricular subjects has broken down. The messages sent to keen minds through manipulation, through doing things, making things, are at least as important as words spoken or read. Pattern-making and physics, dissecting and drawing, calculating and crafts are developmental subjects. So are Latin and literature, geometry and gym. There is no moral nor educational superiority concerned.

In the applied skills there are at least two basic approaches. One educational philosophy calls for a sort of apprenticeship in specific small sets of skills. The opposite philosophy says that technology being what it is, a rounded resourcefulness with broad skills, good attitudes of approach, and intelligent understanding of principles are called for. There are shadings between of course. Whatever the philosophy, the facility will be affected.

Suppose it is agreed that the job is apprenticeship, that fixed large percentages of the graduates will enter a particular local industry, a particular trade—or a branch of that trade. The specific skills are known. The embodiment of that point of view will be a shop which is a small replica, a pallid microcosm of that factory.

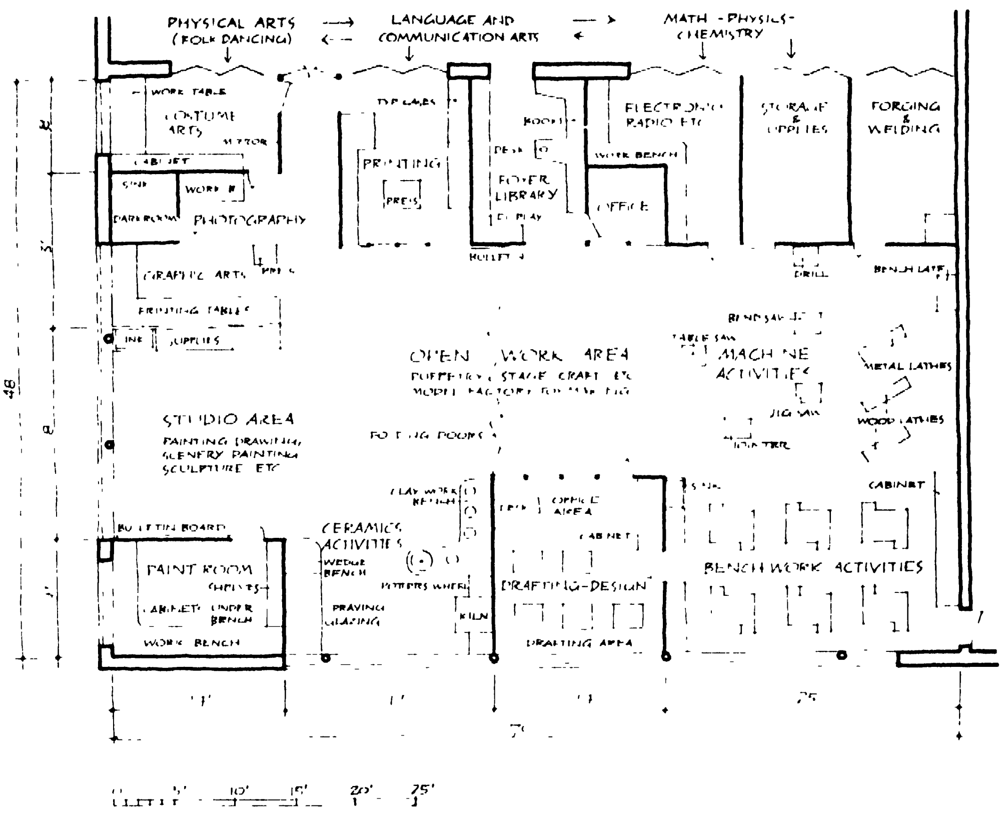
The machinery will be as good as the schools can afford—and since it is "only training" they will not be replaced as rapidly or frequently as their mates in the factory. While the shop is new, at least, the step from school shop to factory will be an easy one. Articulation will be good, as the pedagogs say. Anyhow that shop builds itself. It's a sort of scale-drawing job.

Housing for the other kind of program will be very different. Suppose the philosophy calls for turning out people who know a lathe, a sewing machine, a bookkeeping machine, or whatever, but lots more, too. People must be salvageable when a special need for a limited skill disappears (technological unemployment, they call it). They must have broad experience, broad understanding of machines and hand-skills. The detailed skill of a particular industrial-commercial operation will be learned best on the job. The young wife will not be helpless in the absence of the latest model electric sewing machine. The secretary will not be valueless when the mimeograph or the ediphone is replaced. And so on. The architectural expression of this philosophy is a series of skills shops which facilitates breadth of experience through varieties of activity.

An extension of this idea will dramatize by juxtaposition the unity between drawing (or art itself) and the applied shop skills. The process from a need and an idea, through planning, into execution and completion, with evaluation of the usefulness and the economics of the end product, will flow naturally. All the different subject matters and skills involved will go on within sight of each other. This may be a dream. It needs some great educator to make it articulate, to make it work.

Getting back to the "skills shop" spaces, what if the planners say adults in the community need serving as well as the students themselves? Then these shop-like spaces will become meeting places where they can do things for which otherwise they wouldn't have the tools or space—or the mutual stimulation. Making sailboats, models, drawing, hammering, measuring into beakers, that general kind of activity provides an outlet for the creative impulse. People whose everyday lives are pretty routine need such outlets. But our skills shops will be more than a meeting place, more even than a release to creativity. They have enormous possibilities in re-training, re-schooling people to meet changing conditions of employment, of demand on skill and ability.

A skills building dramatizing the unity of applied science and art by its own simplicity and flexibility, and by the varied nature of its contents, would probably be very beautiful and effective architecturally. Some of the recent great industrial buildings certainly are. Extensive asphalt floors, widely spaced columns, abundant light and a conspicuous lack of partitions make a good factory. They will make an excellent instrument of education. The building will liberate those using it from the restrictions and procedures innate in the traditional ponderous and indivisible buildings. More important it will provide a variety of equipment rather than rows and ranges of uniform equipment. Education for resourcefulness and skill will be carried on in a setting of generalized subject matter and generalized equipment rather than fewer and more specialized areas enclosed in rectangular compartments. The building will contribute to the attempt to break down the



Studios and shops in one big factory-like space divided and shared according to present needs. G. Doczi artist. Courtesy *The American School and University*.

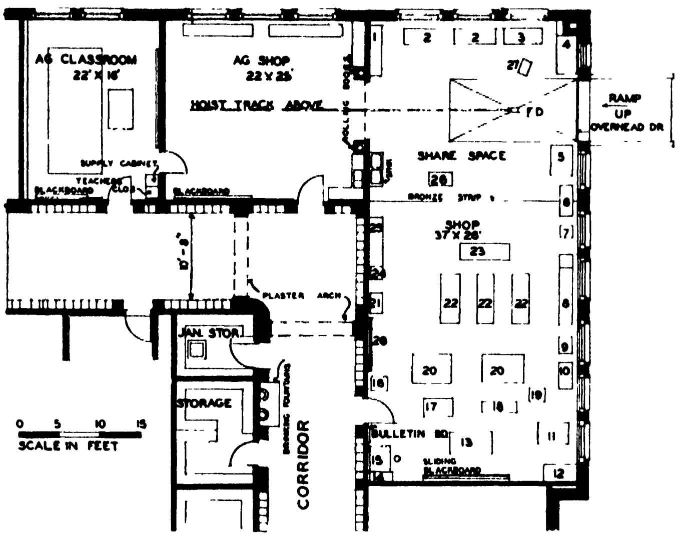
mental over-compartmentalization generally associated with vocational education, if it is to serve this particular point of view.

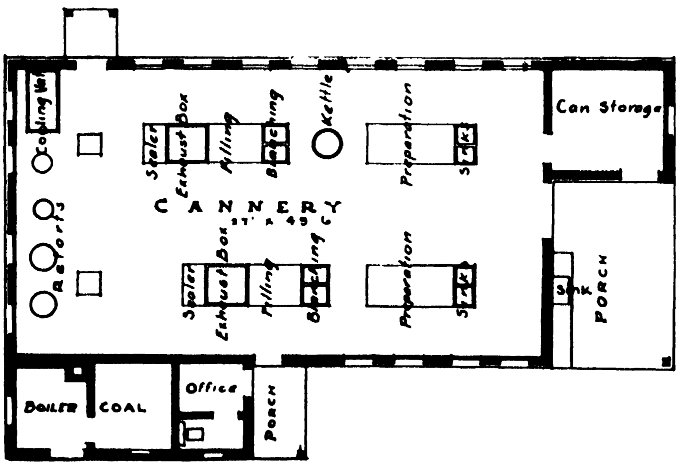
Suppose that the educational philosophy surrounding this particular body of subject matter is extended one step further, and the unity of pure science with the applied sciences is stressed. The subject matter of physics, chemistry and biology is to be removed from the classroom type space and incorporated as a part of the applied skills to demonstrate the unity between the expansion and contraction of metals and the refined measurement thereof on one hand, and the action of hot metals in a forge on the other. Perhaps the imagination is enough to bridge this gap. A building which bridged it physically would deliver cheaper and better shaped laboratory space for the purely scientific subjects than does the classroom type space with which we are so familiar.

Farm Shop

The nearest embodiment to the broad program of applied skills already suggested is the farm shop. It is the most nearly integrated whole experience center, with one hand firmly grasping the value of a tangible product, and the other equally firmly grasping the application of what might otherwise be dead academic matter. The farm shop is also in a numerical sense one of the greatest needs in American school building. In this shop the care, understanding and treatment of the machinery necessary to produce food is studied. It is inevitable that some understanding of the farm itself and of the economics of food production is carried along with it. In physical plan a farm shop may be a simple room, perhaps 70 x 30 feet, with workbenches all around and good window light as well as good artificial light above them. At one end may be tools space, office space and a lecture demonstration corner. The largest part of the area is the central unassigned space at the middle of the room, with its concrete floor, its crane-ways above, and a huge overhead door big enough to bring the largest practical machine into this room. This machine, whether it be a combine, a bus, a tractor or a cream separator, becomes for the about-to-be-adults the group project discussed in greater detail for little children—the object upon which the class concentrates. They get that motor running. They get the cream separator apart and back together again. In doing it they inevitably take along with them a knowledge of the expansion of gases in an

Farm shop and general shop make good neighbors. Courtesy *The American School and University.*





A cannery is often a proper school function. The Interstate Building Service planned this building for school and community use.

automotive cylinder, or the separation of liquids in relation to their specific gravity.

This is a simple building consisting mostly of space. It has a high ceiling and good lighting. In its smallish scale it is the most nearly perfect embodiment of the integrated skills program where theory and practice are each made to serve the other.

The end product of the farm shop building is a body who can approach farm living with resourcefulness and attitude that will keep his power plant and machinery running. He will know enough about farm buildings, their construction, their arrangement and their relation to each other so that he can plan and manage an efficient plant. He will have some concept of soil conservation and water management. He will have some vision of the possibilities of rural electrification and the application of electric power to the business of producing food. He is not expected to be expert in any of these fields (nor will he be when he is fifty!), but these skills are part of his equipment for being an educated, resourceful person.

The general areas and emphases of the shop are a woodworking area, with benches appropriate to this kind of work; a metal working area, including forge, welding and other similar equipment; and the large open group project area in the middle.

The classroom which pertains to this shop need not be a full-sized classroom where each student may have his own individual station. Rather it may be more of a lecture demonstration type of facility where charts may be explained and blackboard demonstrations be made. It is particularly important that this be a room well lighted for night use. Probably the whole farm shop building should be usable separately from the main building, with adult community use in mind. Shelves should be provided to carry reference and reading material particularly pertinent to this phase of education.

The use of this whole facility puts a particular burden on acoustical treatment, which is a "must" of work is to go on and people are still to understand each other. Ample cabinet and locker storage space for individual projects as well as the group materials should be worked out in detail with the teacher who will have charge of this department. A particular requirement is that water and electricity of various types and phase, gas, and perhaps compressed air may be brought to any part of the room. A utility core which can be tapped to obtain these services at any part of the room is indicated.

Since handling machinery is hazardous,

extraordinarily good lighting is required, and every further precaution in the form of guards and safety devices should be employed.

From the farm shop to the farm itself is but a step in thinking, and perhaps there are cases where a very few steps physically should separate them. A boy who is going to live on his homeland needs to understand that land—how to care for it to make it provide for him. In some instances this is the very starting point in the educational circle—learn the land, to get food, to get strong enough, to learn the school's work, to learn to live better off that land, and so on around. You cannot teach Latin to underfed sharecroppers without first teaching them to feed themselves.

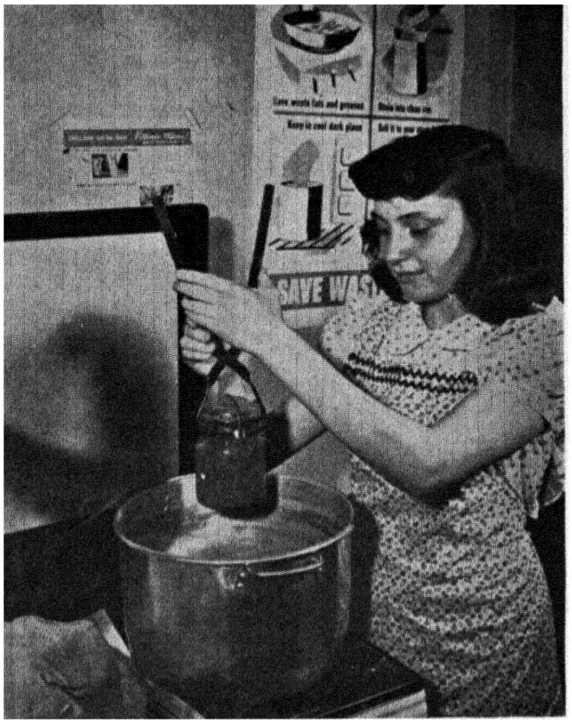
A cattle range can be a subject matter facility as well as can a classroom. If the youngster is going to graduate into a cattle country, it behooves him to be expert in that way of living. Schools have been located in the middle of a cattle area because this factor assumed the highest priority. Sometimes the students care for the school herd and not only help support the school in a very real monetary sense, but earn the capital in the form of cattle by which they themselves will enter the business.

An irrigated field may in a similar way be a classroom—and a self-sustaining one at that. In a land where every drop of water has to be hoarded and made to work, the difference between poverty and the improved living that is the school's objective may be determined by the mastery of water to produce food.

Improving a strain of hogs to live under a particular set of conditions may be the priority subject in one school and the facilities and land for this purpose be as much "the school" as any other building.

The foregoing paragraphs will be easily recognized as "training" activities in distinction from general education, but they may be the precondition to an environment in which such education might be successful. They are certainly consistent with the very most modern pedagogy which lays such stress on the strongest "motivations."

To conduct such adventures in self-support, schools must think of themselves as including some surprising buildings and rooms. They must think of themselves as returning immediate wealth to the community. They must be a place of valuable work by adults who will actually come to repair a tractor, or can a wagon load of cherries, or slaughter and deep-freeze some meat. And so appears—not everywhere—but where a need calls for them: a cannery, a dehydrating plant, a deep-freeze unit.



Canning is part of the school's program, too. Courtesy *The School Executive*.

Canning instruction for adults—and a place to do it—helps a community to improve.

The building which serves these needs varies with each instance, but some guiding principles can be followed.

First of all—it is to process food. The rules of health and sanitation really matter. Drainage, ventilation, ease of cleaning and ease of maintaining the hygiene of the workers cannot be slighted. One of the best known reagents for germ killing and promoting cleanliness at the same time is strong sunlight. It is hard to ignore dirt you can see. Soap and water are also good, and the building should have a hard finish floor and walls which will withstand thorough scrubbing.

Second—These facilities function when the food to be preserved is ripe, which is usually in warm weather. Canning is a particularly steamy process, so headroom and ventilation are important. It sometimes pays to leave the room open into the roof structure, exhausting that space with louvres or exhaust fans.

Third—Size. Thirty people can work in three groups in a room 30 x 70 feet and can put up 2500 to 3000 cans per day. Plants smaller and larger have been built for this purpose. However, in determining size remember that the end product is more than cans. The object is to train and instruct people as well as to preserve food. The application of this is to be sure that the instructors can move freely to every station to help each worker understand the whole process. Any food preserving unit should be so planned that it can operate independently of the main buildings but should still be accessible for use of plumbing, going to lectures, etc.

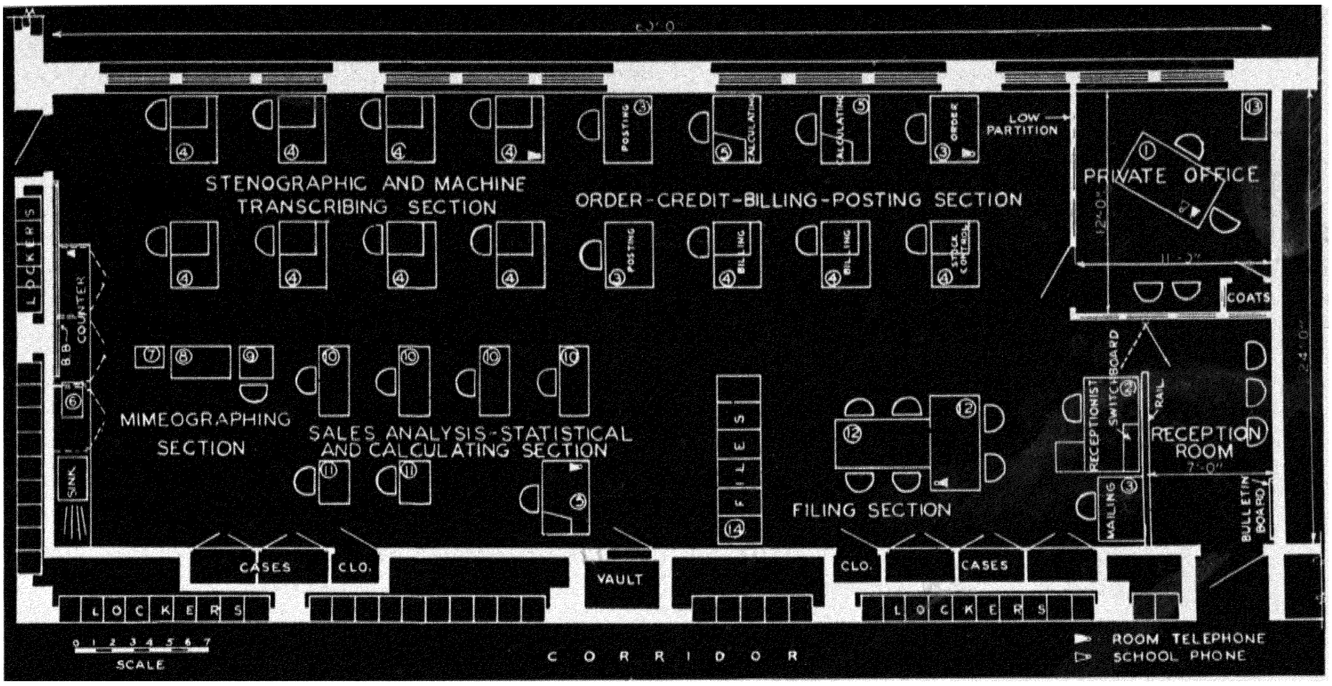
For further detail on this subject the reader is referred to Credle in *The School Executive*, December, 1946, page 55, and Clements, Hollenberg and Nangler of the U. S. Office of Education.

Commercial Department

But perhaps the land to be plowed is city land, and the skills to be imparted are city business skills. The then inappropriate barn and cannery give place to the more functional business courses where the complex steps of recording transactions are broken down into the more understandable compartments of bookkeeping, typing and stenography. Contrary to the philosophy implicit elsewhere in this book, these are drill subjects. There is a right way to do things and only one. (Maybe!)

The characteristics of a typing room are those of a traditional laboratory. Forty square feet per student will give an adequate

Commercial pupils learn to handle the tools of their future trades.



An office practice room for a large school, by Bernard F. Baker and Thomas J. Higgins.

1—Executive's desk, 2—Secretarial desk, 3—Flat top desk (single pedestal), 4—Typewriter desk, 5—Calculator desk (push key type), 6—Gelatin duplicating machine, 7—Shaver, 8—Stencil duplicating machine, 9—Collator, 10—Calculator desks (rotary type), 11—Adding machine stands, 12—Tables, 13—File (4 drawer legal), 14—Files (five 3 drawer letter, one 3 drawer legal).

—and what goes on in it.

room size. Practice is the only path toward achieving this skill, so a rigid room layout designed primarily for the instructor's convenience is perfectly appropriate. Rows of stenographer's desks equipped for the comfort of the students are required in numbers comparable to the class sizes to be scheduled.

The unique feature of this room is the handling of noise, which reaches major nerve-rasping proportions. It almost goes without saying that the ceiling should be treated with acoustical material. A further suggestion is that one wall be treated with acoustical transite to be used as an exhibit wall and to furnish additional relief from the clatter of machines.

Since typewriters are expensive and their use very space consuming, it is wise to keep this facility to a minimum consistent with the number of machines needed to serve the demand in the periods available. Other commercial subjects are handled by reading, writing and lecturing, which means they can be kept out of the typing room.

In a minimum commercial department a room for bookkeeping and shorthand, and the typing room will have to suffice. These are more properly doubled up than either would be with typing because typing should already be designed down to where the equipment is used fully all day. Also, they are less rackety subjects.

The room itself should be wide to provide maximum chalkboard and demonstration area at the front, and shallow so that no student will be far from the board or the instructor. Ideally three rows of students seated in chairs

at tables would keep teacher travel at a minimum and establish closer supervision than the same number in a deeper narrower arrangement.

Supplementary commercial facilities are an office where the instructor can give individual attention to students who need it and incidentally do her own work, and practice rooms similar to music practice rooms where students can take shorthand from recordings without disturbing the rest of the class. An expanded commercial department can provide separate rooms for each of the subjects, lecture classroom with tablet arm chairs for accounting and business theory, and a room like the typing room for practice in other business machines.

Homemaking instruction in school is helped by a homelike space.

Homemaking

The modern homemaking department has the following characteristics: (1) it is a workshop; (2) it has a lot of different kinds of storage spaces; (3) it is a living center; (4) it is a planning business center; and (5) it has a number of unit kitchens.

The basic concept behind offering courses in the home arts comes back again to making living better in a community; specifically to teaching the creation of a good home situation. This is a large order. Running a home is a very complex business— a fact not always consciously recognized by even its practitioners—and preparation for it is correspondingly complex. It is the task of the school administrator, the schoolboard, the home economics teachers, the architect and the good homemakers of the community to plan carefully for this facility, and to decide what the approach to this problem shall be and how it shall be solved. None can do it alone.

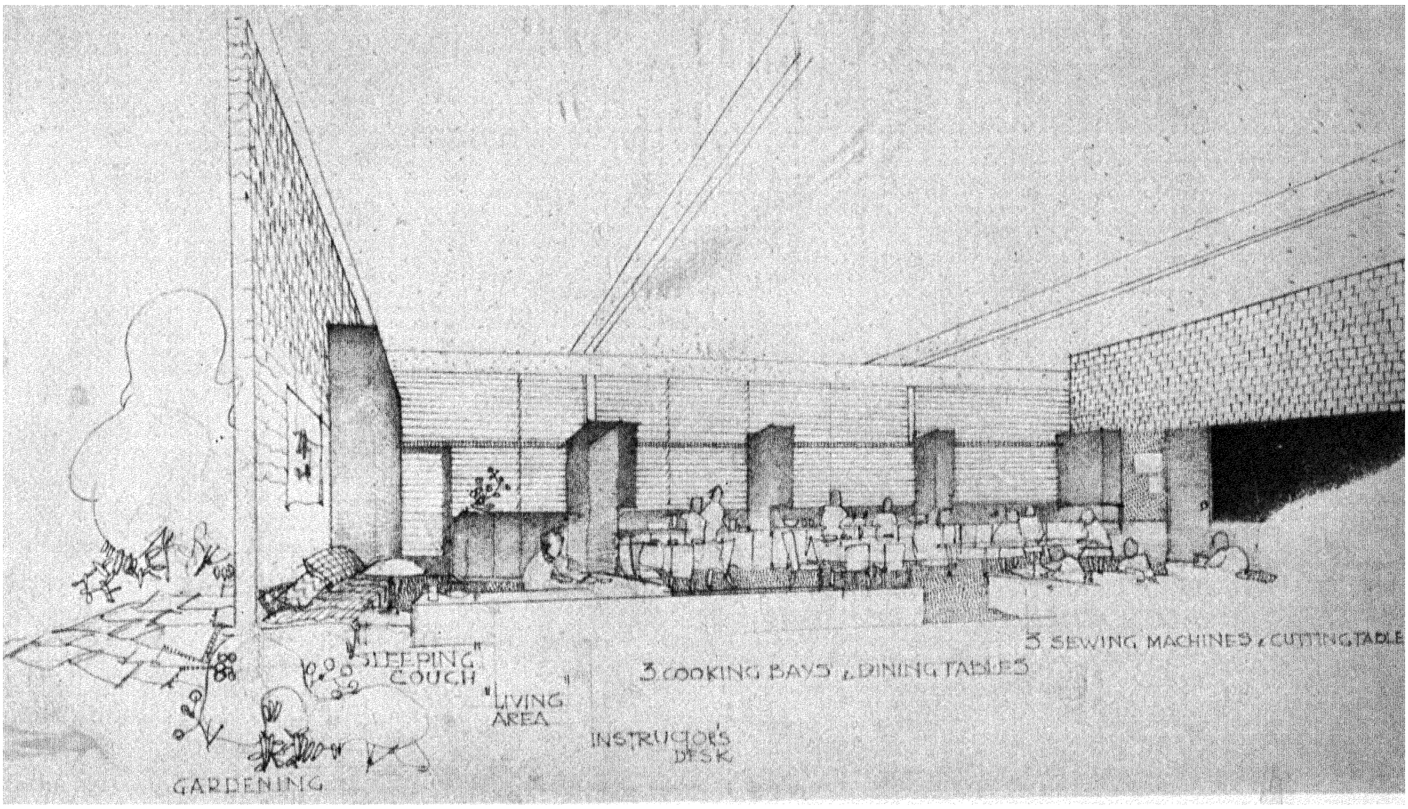
The complete facility includes an understanding of:

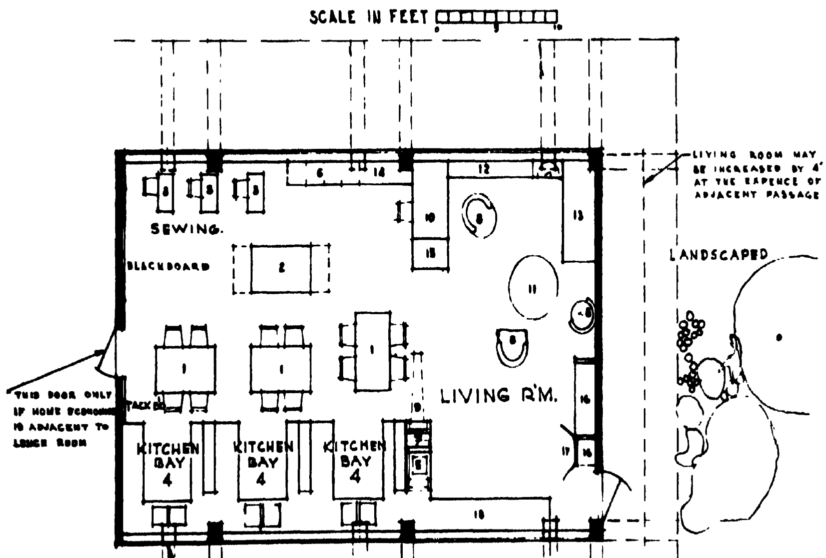
(1) Food—selection, preparation, meal planning.
(2) Sewing—selection of materials, construction and design.
(3) Child care—dressing, bathing and caring for the baby, baby-sitting.
(4) Health and hygiene.
(5) Housing.
(6) Family relations.
(7) Home management—care and furnishing of the home; selection and management of household equipment, etc.
(8) Budget—the economics of all the above.

There are divergent approaches to the job of teaching homemaking just as there are

Ample lighting and ventilation—so essential in homemaking courses—are emphasized in this laboratory classroom of the Acalanes Union High School, Lafayette, Cal. Franklin & Kump architects.

Homemaking room for Puerto Rican school
as designed by Richard J Neutra architect.





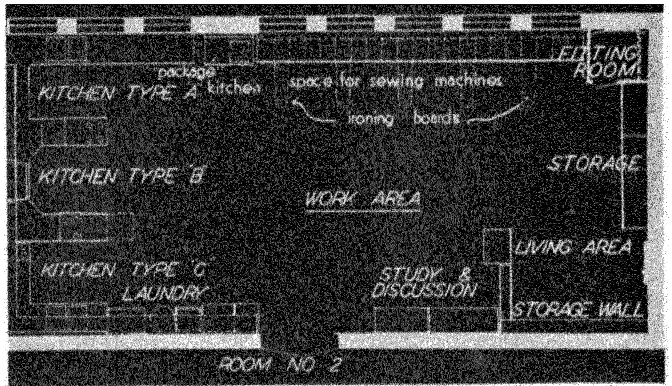
varying philosophies concerning the injection of academic subject matter. On the one hand a prescribed course of cooking and sewing exercises only may be taught. A whole class makes cinnamon buns in chorus or races to see who can stitch up a pot holder most quickly. Where the course is taught in this manner—as an isolated subject—the room becomes a laboratory consisting of stoves, cabinets, table or counter working areas, serving tables, chairs, refrigerator, etc. It can be like any other laboratory where a prescribed series of exercises is performed. It is supplemented by a sewing area either in the same room or in an adjoining room, equipped with sewing machines and cutting tables under control of the same teacher.

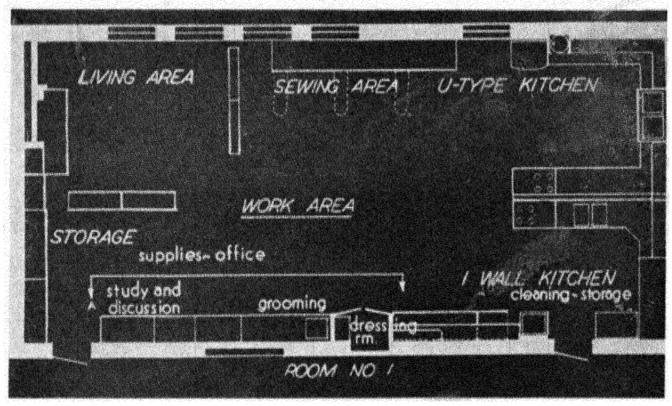
Where possible, the unit kitchen is the best solution to this problem since it reproduces facilities and conditions governing preparation of meals in the home. The basic plan is U-shaped, with the sink in the center, the range at one outside end and the serving counter at the other. The ceiling of the kitchen is usually dropped to provide artificial light close to the working surfaces. The maximum number of kitchens desirable in a one-teacher department should probably not exceed four.

A more authoritarian approach to teaching elements of the home arts has its valued place, particularly in advanced courses. Advanced and fancy cookery can perhaps best be presented by the demonstration method. There the method is to have a spotlighted lecturer perform the particular task of cookery on a raised platform in front of a class, as much like a medical amphitheater as possible, with mirrors on either side of her working area and above so that the class can see down into the bowls being used by looking up at the mirror. This becomes an out and out notetaking affair with the assumption of home practice and the long-suffering assistance of the student's mother.

Another approach is where the class rotates a series of tasks which simulate home conditions so that small squads divide the total job of homemaking among them. Very frequently it is best accomplished by using a house for the purpose. When a site needs to be expanded in a built up area, it is possible to buy one of the houses which is blocking expansion of the site and take it over for the homemaking program of the school. The operation of such a plant implies that each student or each team of students will have a round of tasks—one week in which they study ways of setting up the dining room and the artistry of table

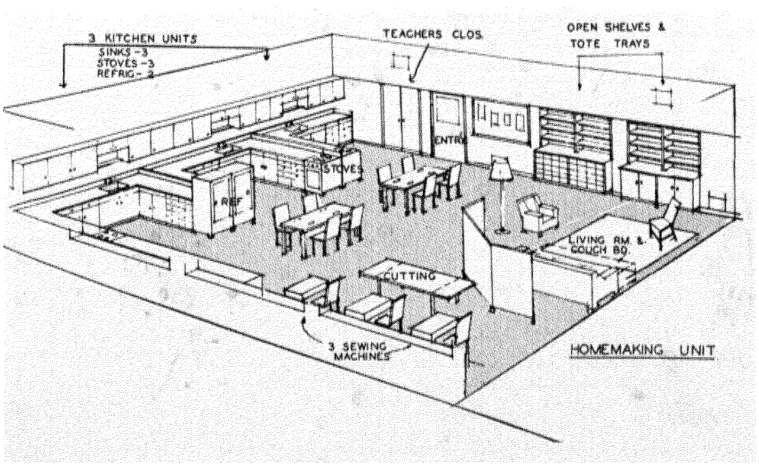
Five small groups or a class together can explore homemaking problems in each of these two rooms. Designed for Washington Junior High School, Pasadena, Cal.





Lunch time at the nursery school. Potential homemakers learn child care by observing and caring for 2½ to 4-year olds.

All homemaking activities are housed in one large space in this small school. Eberle Smith Associates architects.

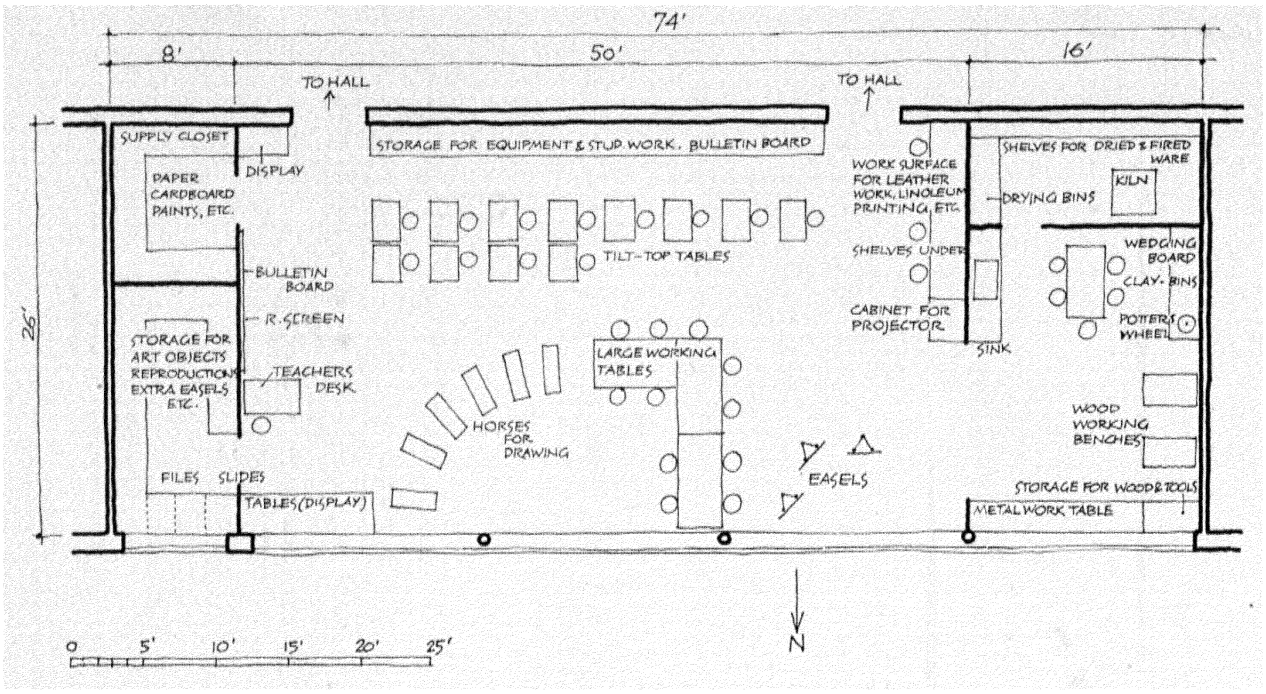


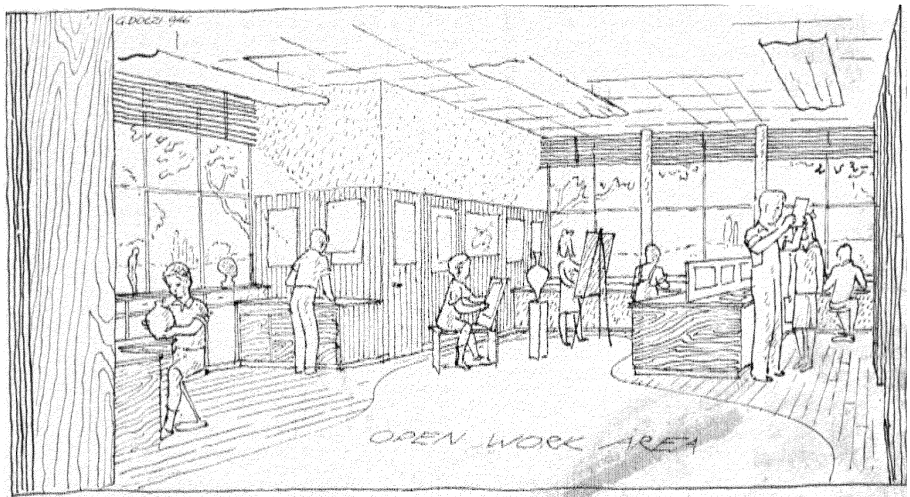
settings; another week, or two or three, in which they function in the kitchen and prepare and clean up after the meals that the entire department may enjoy. Another team may spend a week setting up and maintaining the bedrooms, learning the art of bed making, the use of maintenance machinery like vacuum cleaners, etc. In order to administer such a program a chart is posted in some prominent place in the department and the dates when each individual or group will be on particular tasks are assigned throughout the term. When each of those has been checked off and each has plotted the costs and economy involved, every student has had a full round of the courses offered.

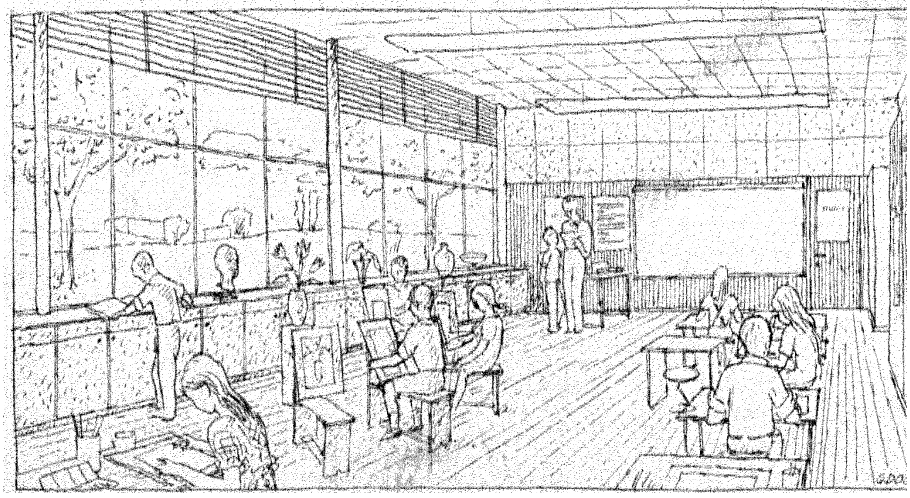
The study of child care is a subject of first magnitude, and people are reluctant to loan babies for this purpose. Therefore, it is frequently worked out that a kindergarten or nursery school wing is included as a part of the high school or included in a junior high school plant so that students in this course can go to that part of the building for experience in child care at this level. The care of younger children is best handled on a demonstration basis, with the mother or the health counselor conducting the demonstration. Dressing and bathing dolls is rarely as convincing as coping with the genuine article.

Where all or most of these subjects are taught in the school it is obvious that the allocation of separate areas for each is impossible, since there must be overlapping. Therefore, the plan must provide for flexibility of function, so that each activity will have space and equipment to function separately or with another activity at a given time. The space must be so planned that change over from one activity to another may be made easily and without inconvenience. One arrangement is a number of small areas grouped about a single main workroom. Thus independent activity may be carried on in the small rooms or in conjunction with the main working room. Folding screens or temporary partitions may also be used.

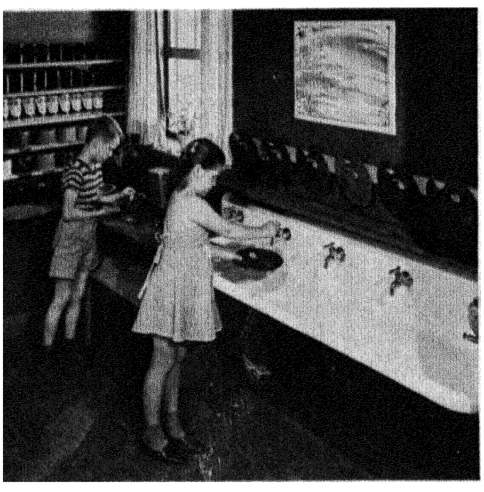
There are other equally important factors to be considered in planning this department. First of all it must be a cheerful and attractive place to work, with a carefully planned color scheme. Second, it must have good artificial lighting for cooking courses, and excellent daylight for sewing courses. Third, electric service and outlets for current must anticipate increased use of electric appliances in all parts of the room. Where an emphasis in foods, for some at least, is vocational, then accessibility to the school cafeteria kitchen is important.







Art can be a profession or it can be a creative release from the woes of the world. It is learned better and appreciated more deeply when adequate provision is made in school equipment. Perkins & Will architects. Hedrich-Blessing photo.



The arts and crafts room fits into the classroom building yet retains greatest possible flexibility. G. Doczi artist. *The School Executive.*

Arts and Crafts

A formal and authoritarian arts and crafts program is difficult to imagine. They are almost mutually exclusive terms. The function of an arts and crafts program is to provide a creative release for students of all ages, from the earliest pre-kindergarten dauber to the tired businessman who is using his unaccustomed leisure to fulfill supressed desires as a creative artist in leather work or abstract sculpture. The essence of this activity is to implement the process sometimes described as "finding oneself" in the sense of creative release.

Of all parts of the school plant this one is the most susceptible to variations in the community itself. In some cases the arts and crafts program means recapturing the weaving skills of a population who learned charming peasant weaving in Bohemia. In another it may be to provide a place for the leather and silver work of Indians who have made themselves artists with silver and turquoise. In a Swedish community the program could well try to capture some of the art of wood-carving and modern furniture design.

From this distance it is not only impossible, it is actively wrong to say what is an arts and crafts program, and therefore to say what is, in turn, a good room for it. A few things can be said with confidence. The essential ingredient in terms of physical plant for an arts and crafts program is just sheer space. A second safe generalization is that it should not be too nice to use. It should be the sort of place where one will not feel the urge to rush and get a rag when a blob of clay falls on the floor. The space can be quite rough and perhaps even should be by preference. Light? Yes. Enough so that it will be pleasant to paint, sharp enough so that it will be adequate for modeling, intense enough so that it will be adequate for metal craft or leather work, but mostly just a lot of space that can be set up for whatever the interest groups are best qualified to do with it.

Factory space is probably the best model. The characteristic of a factory is that you can do almost anything with it and change to something else when the first operation is no longer profitable. In the factory this is accomplished by more than an adjustable structural space. It is done by the handling of utilities in such a way that water (for modeling, water colors, etc.), gas (for Bunsen burners), electricity (for light and power tools), perhaps compressed air, and perhaps steam can be piped around and tapped into at various points in the room. Thus a bench or a table can be set up nearly anywhere against the wall or out in the middle of the room for any appropriate activity, and the utilities which would make it most convenient, even if it is only the correct placing of a light, will be available. If these pipes are grouped in a utility spine along the ceiling with supplementary utility group lines along the side walls, they will be accessible.

Whether the particular form of activity is weaving with its space-consuming looms, or metal craft, with its special provisions, the room should be adaptable so that either or both can go on with minimum interference, preferably in sight of each other. In this way introduction to arts and crafts is really an exploratory experience. Other kinds of work than the particular one in which a particular student is engaged can become part of his experience through observation, and may be the means of interesting him or her in a way which no mere catalog would accomplish.

It is the private conviction of the authors that there should be no distinction between the teaching of fine arts, and arts and crafts; that there is no line between them, and the type of space in which these subjects may be experienced is identical. Definitely one is not an inferior branch of the other. The superstition of north light for painting and the organized formality of a room devoted to this restricted type of activity is contrary to the best interest of painting itself.

Similarly, the shop program, to the extent that it is an educational rather than a training instrument, can far better be modeled on the fluid exploratory arts and crafts shop just described rather than on formalized rows of benches for drill in the fabrication of mortise and tenon joints. It may become appropriate to throw up partitions to create a dark room if the emphasis swings to photography. Those partitions should be within easy reach of the utility spine so that water, drainage, lighting and the like can be provided within it. The whole thing can then be torn down again and replaced by something else when the emphasis veers to clay modeling or leather work, upon the arrival of a new teacher or a new group with different enthusiasms.

In relation to the entire building the arts and crafts program belongs with the technical skills such as the wood shops, the metal shops, printing and the like—the nearer the middle of it the better. It is a place for the generation of ideas and can be the leaven which inspires the somewhat more formalized aspects of the technical program. Negatively, it most definitely is not an ivory tower subject to

being pushed away from the rest of the building in some distant attic or inconvenient basement where a small group of rare souls can think cultured thoughts. It should be a place dealing with reality, in the middle of other busy, respected jobs of work.

The intangible of this room is all important. It cannot be overstated that space similar to that we give over to classrooms is as inappropriate as it can possibly be. It is too finished, too restricting in its plan, and will be conducive to fussy formality. The secondary objective of an arts and crafts program is to teach people to make useful things beautiful. The primary object is the pleasure and experience they get in doing so.

Science

Science in public schools runs all the way from the study of water boiling or magnetism in the elementary classroom to the understanding of diffraction grating in high school physics. The provisions of specialized laboratories for drill, lectures and demonstrations in biology, in physics, in chemistry are established pretty largely by the equipment itself. If the program and philosophy call for that type of learning activity, *and* if the size of school warrants separate spaces fully equipped, the problem is relatively simple, if expensive. There are those who say that this specialization is not justified. Certainly problems of almost complete inflexibility are inherent in a layout with concealed piping, conduits, etc.

In the vast majority of communities simple tests of space utilization alone would rule out such provision. The skills associated with biology and chemistry overlap tremendously, of course; so with any pair of the sciences. It challenges design ingenuity to achieve a general science laboratory. It can be done. It puts a somewhat greater strain on storage requirements. There are more kinds of materials than are needed for any single science. Individual boxes must be provided for each student's own material "in process." But visualize the enormous duplication of equipment ranging from forceps to microprojectors which will be eliminated. And schedule-makers will rise and call you blessed for years to come for such all-science laboratories.

Further than this goes the philosophy which sees different ends to be achieved, different and broader values. We've had something to say about the sciences as a part of the skills program—and thus in the skills building. We say it again here. Is it only accident that the demands the sciences make on utilities, for example, are so like those made by shops, applied skills? Or is it their cue to the educators, a clue to the interrelationship of the skills and the ends sewed by physics and the machinists' craft, biology and agriculture, chemistry and foods? Paths toward understanding of these relationships have been blazed by "vocational" experts. They should be further explored by general educators. Programs and courses will be hard to lay out, even to envision. They'll be hard to teach. But we submit, they'll be worth it—to students exploring and growing—to the community and nation groping for social understanding by scientists, scientific understanding by social and political leaders.

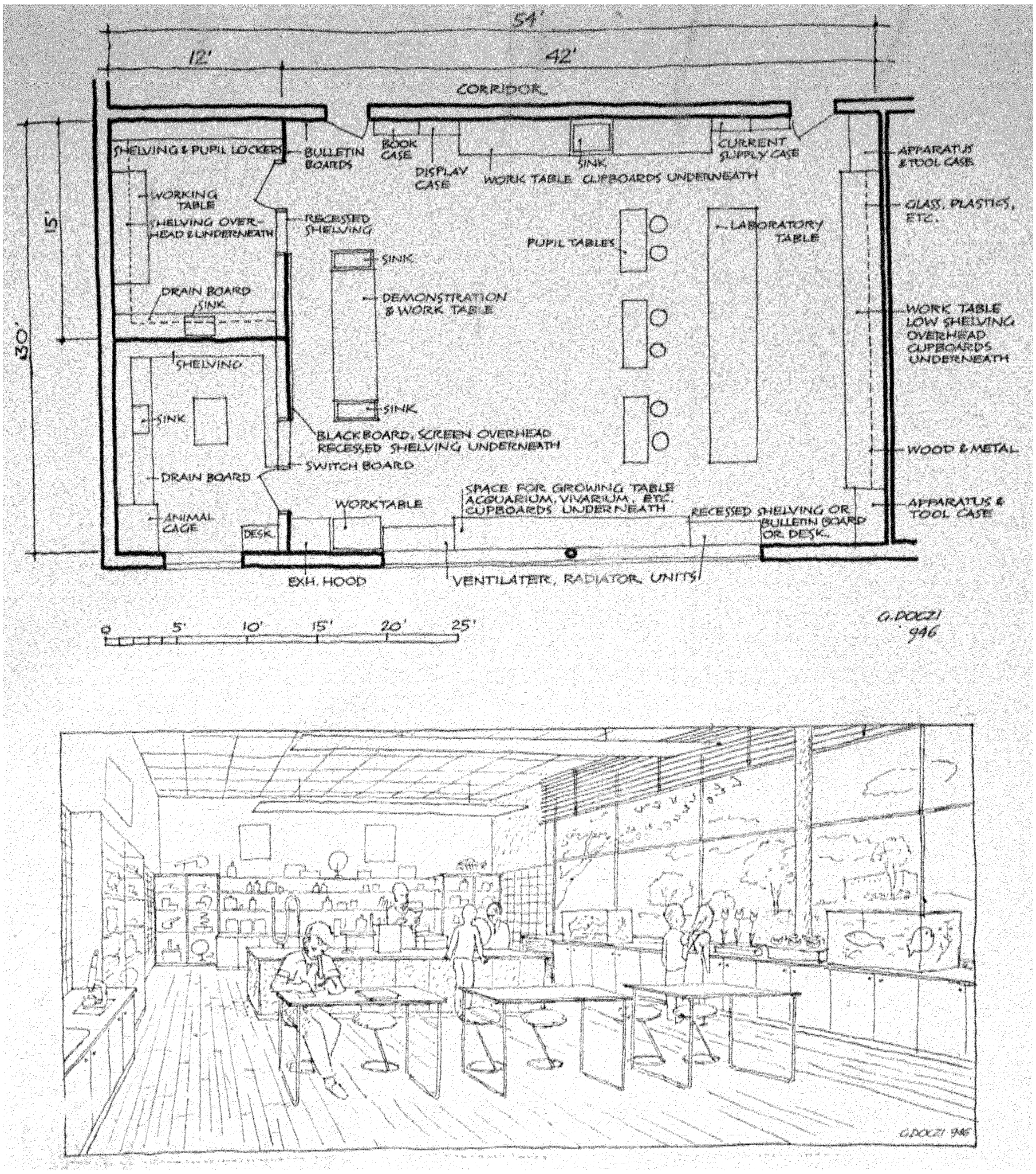
The space for such a program is more of the same. It is factory-like area with expendable partitions, if any. It is exhaust-vented, well lighted space, described under arts and crafts. It has utility cores available at nearly any spot. It is accessible and set among the other activity areas like home-making, arts and crafts, shops.

It shouts the facts of interrelationship. It frees students, breaks barriers of academic isolation. It unveils the mysteries. Maybe it even makes sense to adults whose problems are not so neatly compartmentalized.

Shops

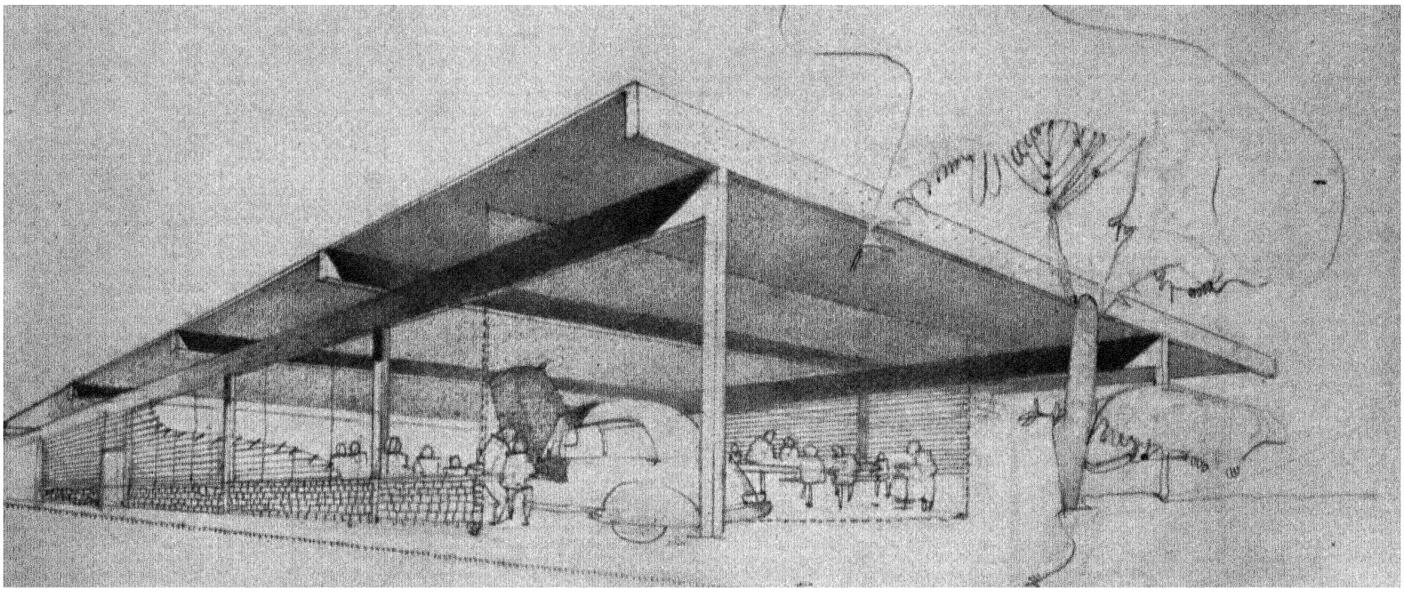
At last we come to the shops. By now we've revealed the perspective in which we see them. They're places where people come together with tools (hand and power tools) and materials (wood, metal, machines, etc.) for the purpose of doing something with the tools to the material. Educators expect that this doing something will not only make the material more useful but will affect the people. Where the primary objective is improvement of the material you have the factory, the assembly line with high specialization of tools and skills. If the central job is to help people grow and develop, give them attitudes and resourcefulness that will make better people, richer people of them, a different lining up of the elements is called for. We'll confine ourselves to the latter point of view.

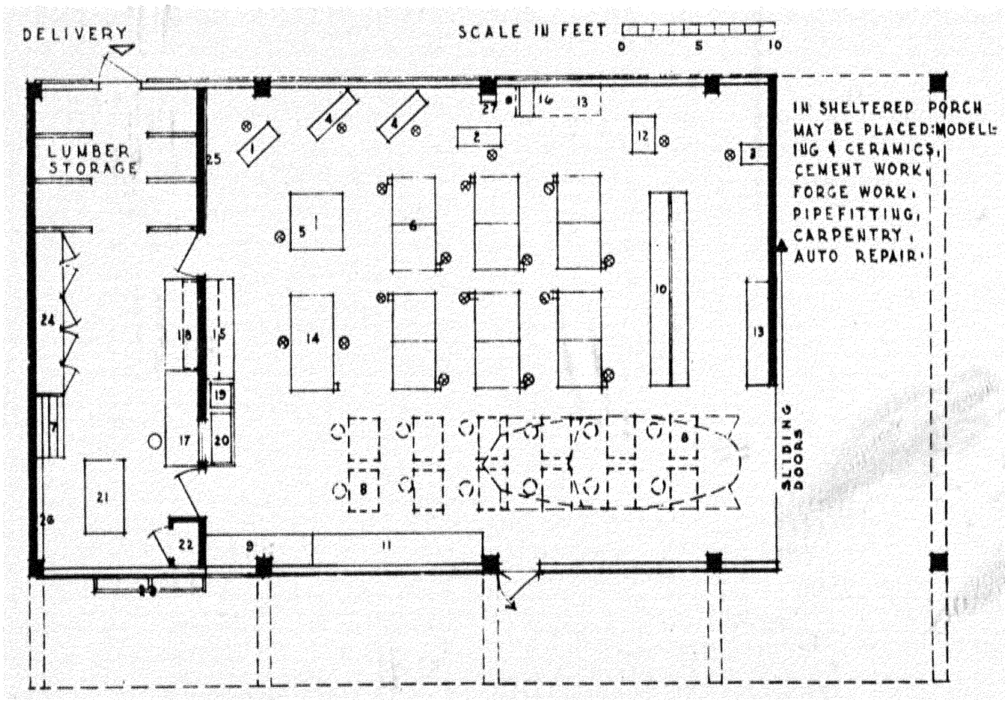
There are woodworking shops, finishing shops, metal working and machine shops, print shops, building trades shops—and there are general shops. Shop activities run all the way from a bird house built in the elementary classroom to the machining of a vital bearing in a farm tractor in the high school. It is no mere chance that the extremes listed have in common the obvious usefulness of the task. Shops are places where useful tasks are done.



A science laboratory which will serve general science, botany and biology.
Courtesy *The School Executive.*

Airplane engines have a place in today's shop program.

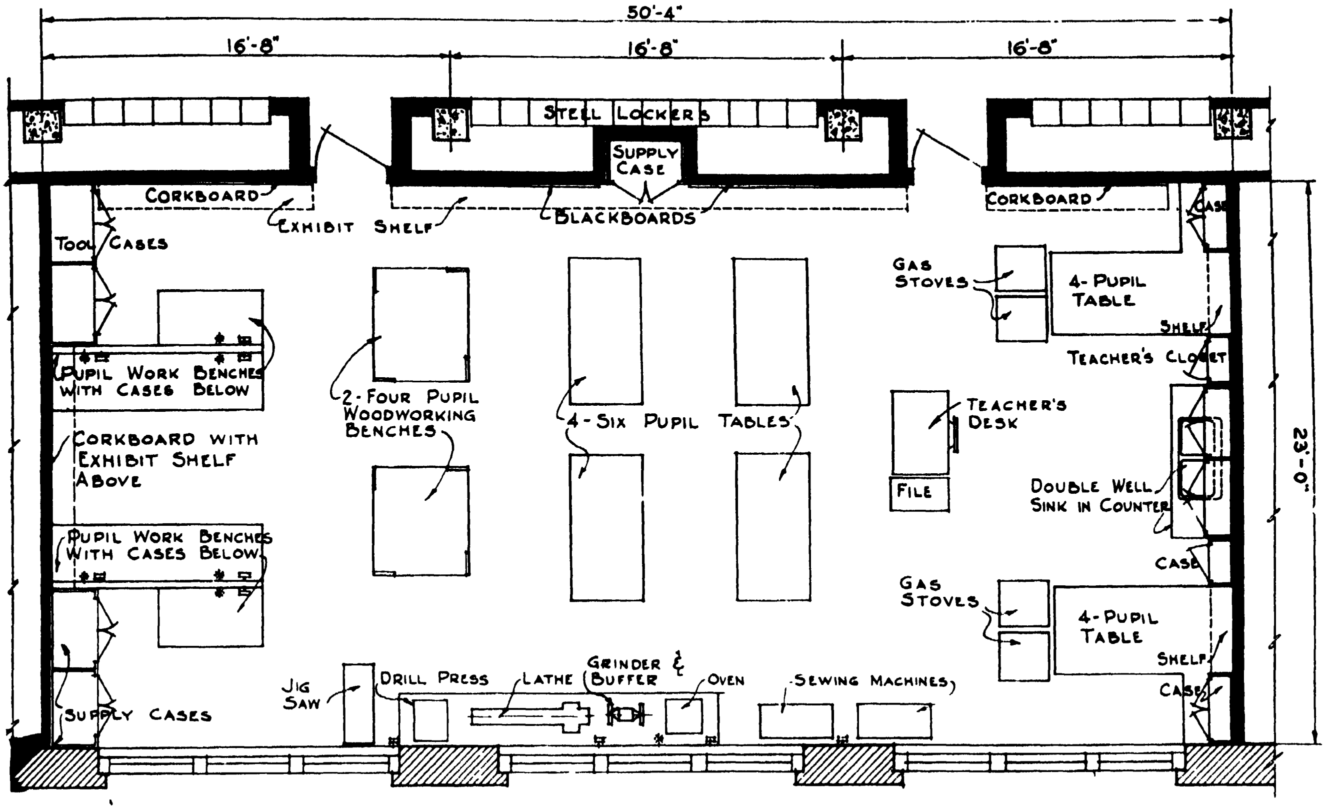




Plan for an industrial arts unit in Puerto Rico, designed by Richard J. Neutra. Note that provision is made to give vocational instruction in crafts which may well become livelihoods for students.

This printing class is learning in the atmosphere of a commercial shop.

Elementary school shops can be fitted into the semi-traditional classroom building. They need space, storage, light, utilities and flexibility.



Hence we refer you to the section on auditoriums. We said there that shops handy to the stage were useful. There's a principle involved, which is good for most shops. They ought to be where they'll be useful.

The woodworking shop is a factory-like space again. See comments under flooring. It needs light on the task. It involves careful planning for safety. Hand tools are used. They need storage. A word here against the space and time-consuming tool crib. Panels will do, with a space clearly marked for each tool. If they have to be locked, then free swinging doors need to be installed. Power tools, lathes, saws, joiners, etc., are required. Most programs use hobby-type, or at least fairly light machines, each with its own stand and motor. Benches are important and space beneath them will do well for storage of work in the process. An instructor's office must be provided, but let's avoid "permanent partitions." Dust-proof finishing rooms with drying racks are important. Paints and inflammable materials must be stored — in smallish quantities near where they will be used. Lumber takes storage—space accessible for delivery of long pieces from outside and removal to place of actual use. Pipe racks are convenient, but much can be stored vertically, too. Sinks, acid-proof, for washing brushes, and hands, are important. Free floor area, chart and blue print display space, a chalkboard—all are used. And good planning will take into account the adult uses, too. Mostly this means more storage. Noise control is highly important. One person's tinkering is a cheerful sound. A dozen people can wear each other out fast.

The metal shops present similar problems. A forge, lathes, folding and bending machines

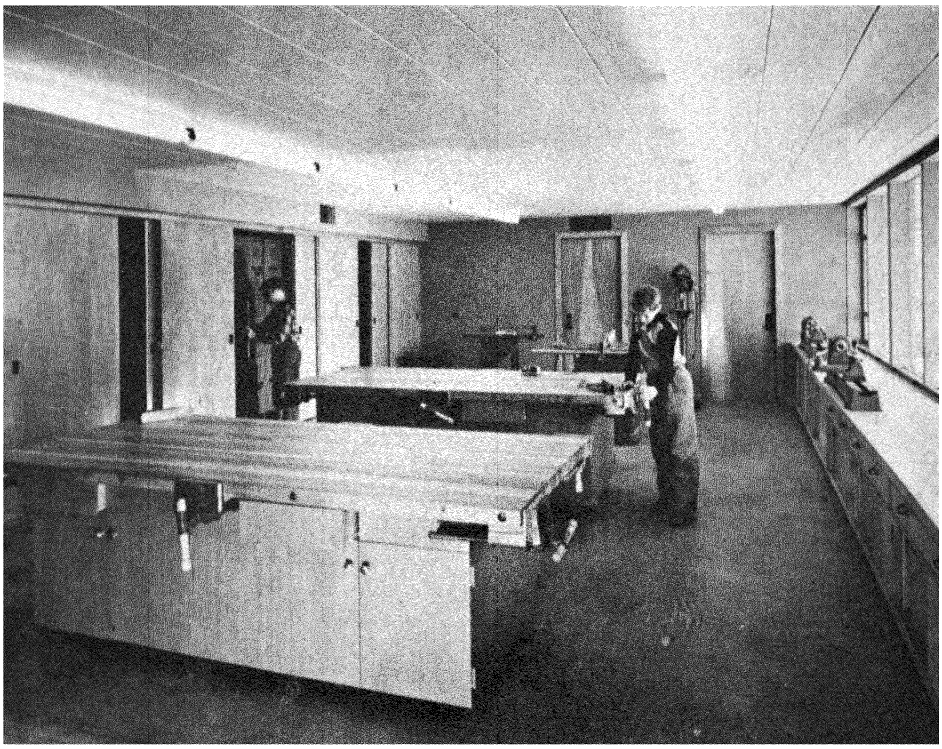
and the like all raise the question of use—of purpose. Hobby metal work is one thing. It probably belongs in the arts and crafts shops. Sheet metal, foundry and like vocations are another—if there are skills which can be created in a void. Automobile and airplane mechanics are still different. We've outlined their requirements pretty much under the farm shop.

The print shop is another of the vocational shops which we'll mention—and pass. Linotype, varitype, offset processes make much of the old type-font skill technologically obsolescent at least. If it is a service shop for school and community work—commercial in fact if not in name—that's another story. It will be designed then by analysis of the kinds of products economically feasible, and the machinery to produce them. Undoubtedly extra space is required for instruction beyond that required by the operation itself. The printer-instructor can lay out this area. Lighting, flooring, anchorage for the relatively heavy machinery are special problems. So is control of noise within the room and insulation for surrounding areas. It does, however, belong in the skills building by virtue of its demands on the building and its sharing of common ends to a large degree.

Summary

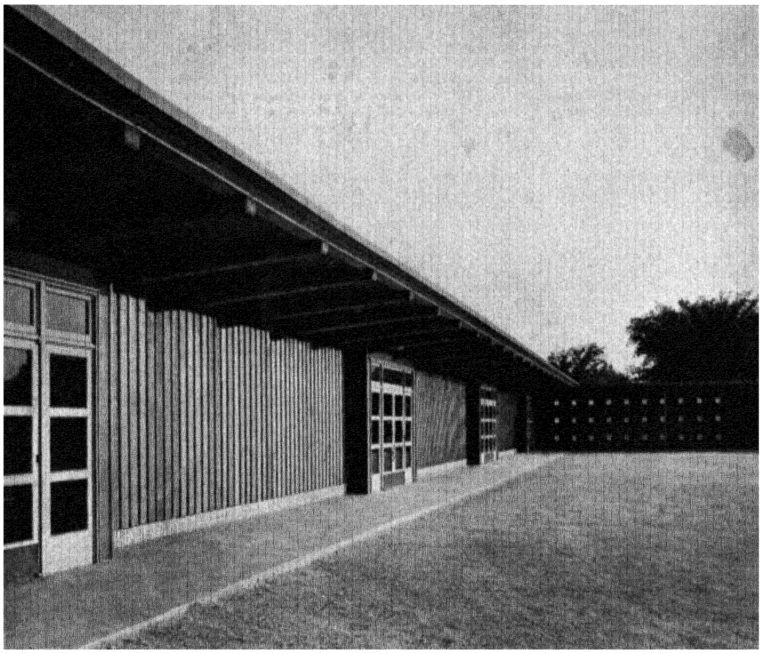
We've touched lightly on lots of different activities—and lots of spaces. We've implied even that perhaps it isn't lots of spaces, but rather lots of the same kind of space that's needed. Constantly we've tried to check against the educational philosophy, the purposes of the activity as well as its nature. That is a valuable attitude, and one we commend to the reader, be he architect, educator, or "consumer."

Nothing new is claimed here, neither in the theories of education nor their implications for design. Things we describe can be found all over America, here and there, bit by bit. But the full realization of the learning and architectural potentialities suggested here awaits the courage and vision of some community planning group with its technical and educational advisers. They must see clearly the needs of today and tomorrow. They must cast off the shackles of tradition. They will build wisely, economically, effectively, beautifully. They will erect more useful, more used school plants than any we know today.



This work shop in the Greenwood School, Waukegan, Ill. features plenty of storage space. Ganster & Henninghausen architects.

CHAPTER 6: Facilities for Health and Physical Education



Sheltered and unsheltered play areas for younger age groups at Crow Island School. Eliel Saarinen, Eero Saarinen, Perkins, Wheeler & Will architects. Hedrich-Blessing photo.

The Greeks had a word for it. The Romans called it "Mens sana in corpore sano." We call it health and physical fitness. It's nothing new, not even as a matter of public concern. As a function of the public schools, however, it is new and still growing in importance. Health, safety and attention to the development of the body itself all make sense. To an America shocked by the cold statistics of World War I's Draft Board rejections came an awakening realization. This complex modern civilization was making demands on the human body, at the same time increasing the obstacles in the way of normal development for that body. Something had to be done. The schools humped themselves to do it, logically enough. It was a hump though—perhaps even a bubble. At any rate World War II popped the bubble of our conceit. Illness and absenteeism counted right out where everybody could see them. Our people weren't uniformly strong, uniformly healthy. And it mattered—urgently, horribly then—importantly, vitally, still. Schools took on a lot of the responsibility for health and body development after 1918. Citizens and their schools are even more serious about it today.

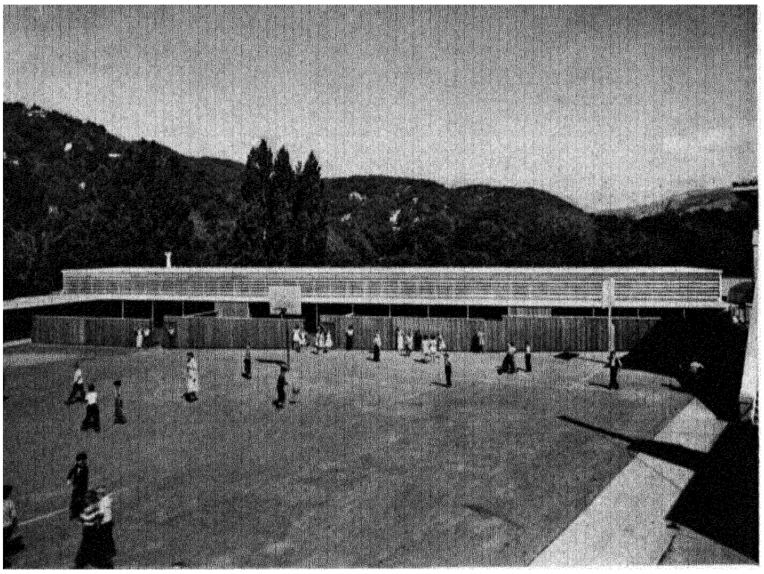
Anything as important to the child and community today, the community and the world tomorrow, takes a big place in planning. The citizens know it, schoolmen, too. But the importance, the ideal, is not enough. There has to be a program, activities, services. And this program has to be housed—some of it. All of it must be facilitated by the site development and building plan.

What that plan, those facilities, will be is determined by the objectives and consequent program to be served. Objectives must be crystal clear, program carefully defined. A way of meeting one kind of program is to provide aisle space for calisthenics in a classroom. All of us have seen that one. Most of us reject it. It served the program quite well, but failed dismally in meeting the large general objectives of physical education.

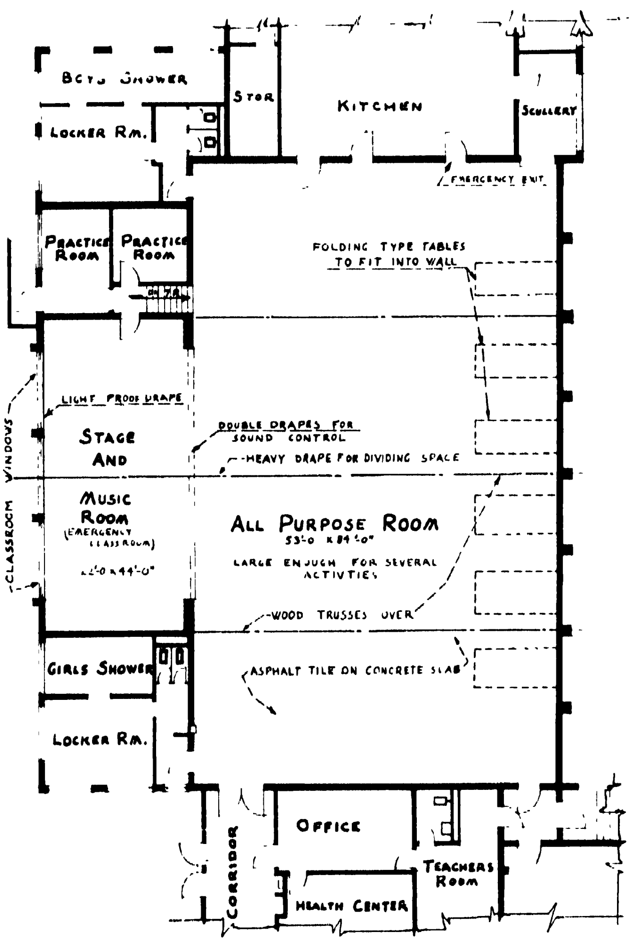
Another way provides huge arenas in which ten or twenty boys entertain their fellows and lots of neighbors, too, in a demonstration of teamwork and physical fitness. The others, less fit to start with, exercise by climbing to bleacher seats and cheering violently. This makes less and less sense, educationally and financially, to more and more people.

There are other programs. Emerging throughout the land is a concern for every child's health and development—a philosophy with large implications for health and physical education programs. Provisions for these programs take space. They take planned space—costly space. This space challenges ingenuity and creative design.

First come the special aims of the com-



Organized space for organized outdoor play adjoins outdoor classrooms of the Fairfax School, San Francisco, Cal. Bamberger & Reid architects Roger Sturtevant photo. Below: An all-purpose space is surrounded by the special facilities that make possible the several activities in the large room. Edmonds School, Edmonds, Wash. William Arild Johnson & Harold W. Hall architects.



munity and school in this area. Then the planners get down to cases. What health services will be offered? To whom? By whom? Where? Will the health suite serve other members of the community? Pupils only? Or will a first-aid kit in the principal's office be enough? Is health service a function of administration—near the office? Or is it part of physical education—near the gym?

What about this gym—this physical education? This is an expensive facility. Mistakes here hurt—bodies and pocketbooks. Floor space for indoor play costs a lot. Few communities can afford the space required for indoor play for each student each day, yet many consider this ideal. Some are rediscovering the great outdoors. Necessity truly becomes a virtue. Facilities indoors and outdoors are being coordinated, happily. But still in most climates there must be an indoor provision.

Suppose the planners hold that all the youngsters in the school should be served as well as possible, suppose it is important that every child be alert and responsive in his other activities, that each will know team effort and individual conflict, that each will know an occasional victory. Suppose a conscious attempt to build in each child interest in a sport which he can continue to enjoy. And that every child will get the training and help in physical development which is best for him or her as an individual. Then exhibition athletics is forced to give ground.

The architect and school people translate the objectives further into specifics. They get to figure sections of exercises, games, drill or whatever—and find themselves setting up equations. Three thousand seats equal two moderate sized playing floors. A choice must be made. The community may be happily exempt from money limitations. That makes choice easier, or unnecessary. Most are not so situated. In either case the philosophy, need, and means must be translated. It is specific activities of real, measurable and countable people which must be housed or implemented as simply and inexpensively as possible. Real creative attention should be given to using the site itself to the utmost. This means planning for paved areas, wind-breaks, and playing fields. It means complementing plant with site. But here we're really talking about the plant.

Playrooms

Playrooms should be defined and distinguished from gymnasiums as an instrument of physical education. They apply primarily to the elementary grades, where exhibition

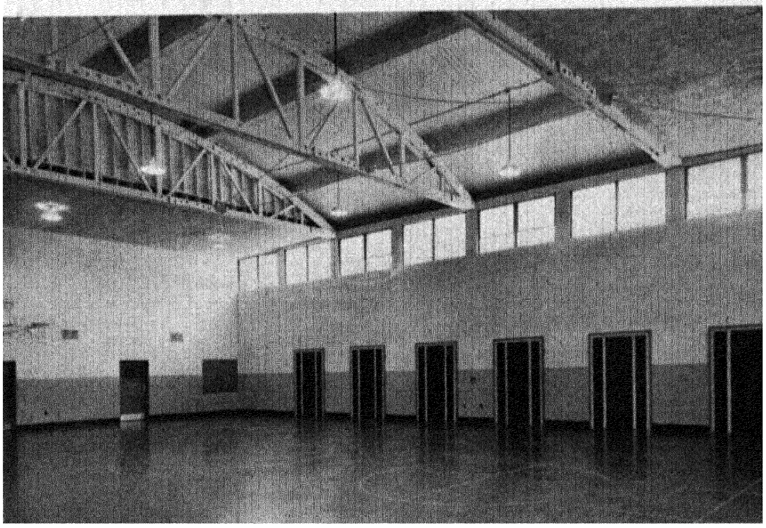
athletics have not yet become a problem. They are rooms for round games, for dancing games, those games called "rhythm" and running activities. Formal equipment is at a minimum. They may also use balls, but the problem of a horsehide baseball, sailing into the outfield bleachers or a basketball's high arching flight into a basket is distinctly not a factor in this type of room. Many elementary playrooms need to bear the additional burden of being suitable for basketball and other formal games wanted by the community. If they fill the need and fit the program the community wants, that's all to the good. They probably are not playrooms then primarily. The playroom can be a community gym, or a community room.

A minimum size for such a community room for a four classroom school can be as little as 30 x 60 feet. Its characteristics are that it is well lighted, easily entered, adequately provided with seats when its use as a place of assembly is paramount, and with windows, lots of them, along each side.

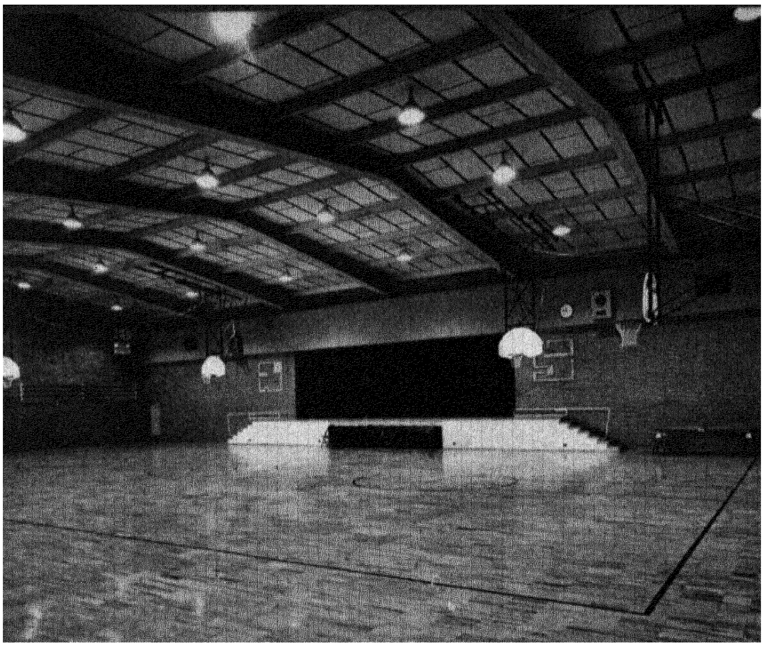
Since the community meeting function involves setting up chairs and having speaking, musical and other type programs, it is wise to have chair storage immediately accessible. Another device which has been found useful has been to have an alcove with double doors opening immediately into the playroom, where a piano can be pushed aside when it is in the way, or the games are too rough for it. And don't think that little children are not that rough, or that pianos do not loom that big.

A more usual size, remembering still that this is not an exhibition basketball court and has no ambitions along that line, is from 40 x 60 up to 45 x 70 feet. A particularly successful device in this type of room is the wood or steel arch trusses which permit low side walls and a double pitched roof rising to a fairly substantial height at the ridge line of the room.

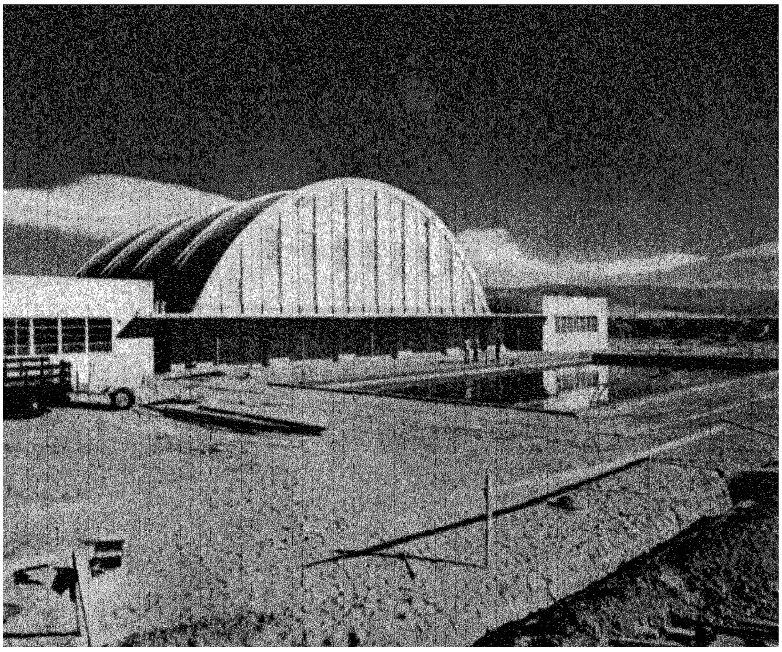
The esthetic possibilities of such a room are limitless since it will have many more uses than simply as a playing floor. This room can be a far friendlier place than a gymnasium. As such, it is not only suitable, but pleasant for dances and teas, receptions and social affairs, very much as the community hall of the church is sometimes used. Several important details of design contribute to this effect. First, enough windows. Windows with intervals between them reduced to as nearly zero as good construction permits, so that the room is flooded with light from its two long sides. Glare and contrast normally associated with gyms disappear. Then a very low sill.



Dining tables fold away to clear the all-purpose room for the next activity. Below: Playroom—all-purpose room—at Burlington, Conn. Elementary School. Moore & Salisbury architects.



While combining space for exercising with space for group seeing and listening is not recommended, sometimes the budget dictates doubling in brass, as in this Grayslake Hioh School gymnasium-auditorium, Grayslake, Ill. Ganster & Hennighausen architects.



The parabola of a basketball shot could have served as pattern for this functionally designed gymnasium at Palm Springs, Cal. Harry J. Williams architect. Gayle's Studio photo. Below: Gymnasium means more than basketball. Group dances need space.

One as low as the back of a low bench along the walls (and the heating system) will permit. Object: So that you can see out, so that you won't feel trapped in the bottom of a well, surrounded by sanitary and unbreakable surface materials. There are netting devices which can be used for both the decorative curtaining of such a room and as a shield to keep balls from going through the glass.

A fireplace is another such detail. A big fireplace at the end of the room away from the entrance. The type of fire screen which can also act as a shield keeps this from being a liability when not in use.

In the design of this room it is essential to remember who will use it; that the object of the room is to provide a place for freedom and release and play for relatively small children. It must not be confused with the utilitarian aspects of larger gymnasiums.

Gymnasiums

The country is dotted with facilities for exhibition athletics. A playing floor, in round figures 60 x 100 feet, is surrounded by an amphitheatre of sloping, fixed seats, starting above a cockpit wall 7 or 8 feet high and sloping upward until the crowd has been accommodated or the pocketbook exhausted. Underneath these fixed seats are located lockers and showers at the playing floor level, from which trained athletes can trot out onto the floor with suitable conspicuousness. Books and periodicals for years have presented solutions of sorts to this problem.

A variation also frequently built and widely illustrated is this same design with pull-out bleachers extending onto the floor below the line of the fixed bleachers.

In each case the philosophy has been to implement physical education by a screening process, selecting a group of athletes sufficiently small to be manageable, sufficiently good to win games.

Many states say in their statutes that every student must receive a certain number of minutes of physical education each week. The physical expression of such a program has dealt a crippling blow to the kind of design mentioned above except where money is virtually unlimited. The conflict comes very simply between floor area to serve class groups at work and play and the cost of fixed seats for crowds. The need for a full physical education program, for a rounded program in a relatively large school, is a large number of playing areas, in contrast to one large single area. There are several devices for accomplishing this. High on the list is the previously mentioned pull-out bleachers, the idea

extended to where this is the only kind of seating employed. Thus, substantially all of the area consumed by spectators can be retrieved for the day by day physical education of an entire student body.

There is the additional problem, when total playing area is limited by budget, of dividing a gymnasium so that boys and girls can use it simultaneously. Hand operated and electrically driven folding doors, which are contained in pockets at the middle of the side walls, can be extended to form a gymnasium into two areas. It can be subdivided even further by additional doors coming from other directions. This device has been perfected to the point where it is not just another gadget. There are examples of automatic ones in their fifteenth year of relatively untroubled operation.

A planning problem is imposed. The boys' and girls' locker rooms must be located so that they debouche into the proper parts of the gymnasium, and so that they also open into the proper part of the playing fields outdoors without crossing the public traffic coming to this room.

The somewhat utopian answer to the whole conflict of big spaces versus little spaces is best resolved, if budget permits, by an exhibition floor, presumably the boys' gym, supplemented by a series of practice floors, completely wall bearing, and with short span roofs. These could be about 60 x 80 feet, so arranged that any room can be used equally well by boys and girls, and each has direct access to either set of locker rooms. The class groups would be taken care of in these smaller rooms.

A few notes on these smaller rooms, which seem to be the coming fashion. They can be pretty plain. They should have a terra cotta wainscot to the height of 7 feet, and—an esthetic matter—the door openings should be designed to tie in with this horizontal line. The lighting, which could conceivably come under a skylight, should not do so, since this gives rise to heating and maintenance problems mentioned elsewhere. But the windows can be set in the roof with the center part lowered and the ends raised in such a way that the lighting falls on the end walls of the room rather than into the eyes of any player. Another similar device is a vertical strip window at the four corners of the gymnasium, each in the side wall with the end wall carried past this window so that a player on the floor does not look out into the sky glare. The end wall containing the basket or tennis backstop then is abundantly lit by daylight. This vertical window should be supplementary to a band of horizontal windows on each side wall above the eye line.

These rooms are in sharp distinction to the playrooms discussed earlier. These are functional pieces of athletic equipment, designed as an instrument for playing certain games. They are not ordinarily places that anybody uses except to play those games. However they can be used effectively for school dances, and other large group gatherings.

Lockers and Showers

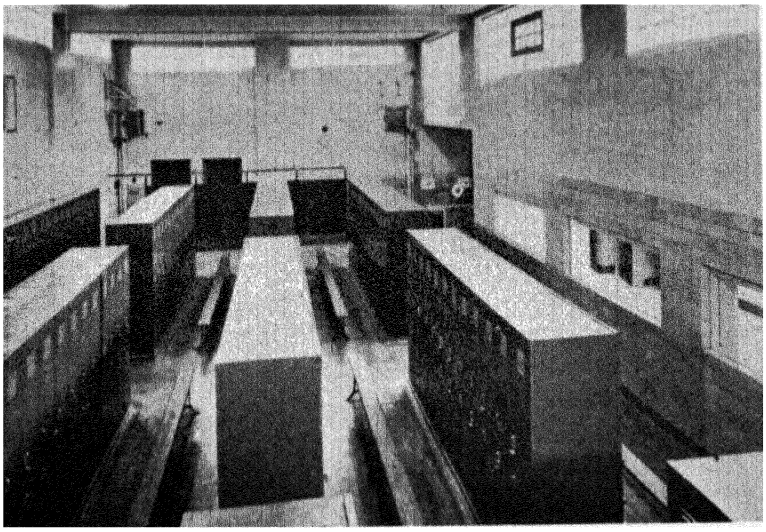
Lockers and showers are a more important subject than most people think. The adequacy of this part of the plant has an enormous effect on the effectiveness of the more conspicuous parts of the physical education plant. The ability to handle students readily and comfortably, and above all quickly, may make all the difference between a few groups or many groups using a particular playing floor each day. Or conversely, they may, by bad design, shorten the period so as to make the work on the playing floor nearly worthless. Not always remembered is their function as an adjunct to the entire outdoor physical education plant, as well as that part which is under roof. There is no possibility of presenting here a check list which will enable every designer to meet every problem of locker and shower rooms, but a few points are worth keeping in mind. The space for lockers, showers, dressing and their ancillaries can easily be as large as half to two-thirds of the gymnasium area itself in a small school, and this proportion does not drop violently as the school is expanded.

Lockers and showers are nearly always relegated to space that nobody else wants for anything, such as basements. This is all right if the mechanical ventilation plant is good enough, but since schools run into budget trouble operationally, there will come a time when the ventilation machinery is not used. Lockers and showers will stink, metaphorically, and also be permeated by that "healthy" smell. For this reason many states require that lockers and showers not be put in the basement and that they have direct outside windows. It is possible to split the difference in this regard and have outside windows and still put the lockers and showers below the gymnasium by raising the gymnasium half a floor level. This is particularly possible when sloping sites can be exploited to get separate entrances.

Further note: Boys' lockers should have access to the gym, the boys' playing fields, the corridor, and the public entrance to the gym. Girls' locker rooms ditto ditto. And the lines

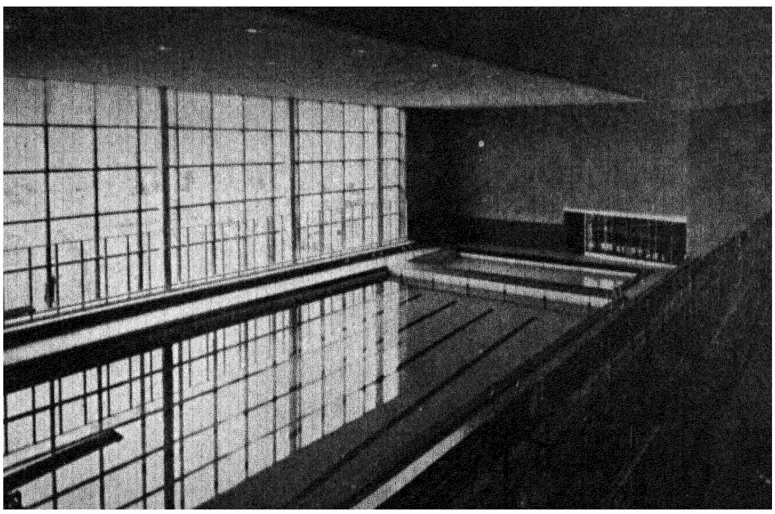
of traffic should not cross. This is frequently an insoluble problem, but it is still a good ideal and is sometimes achieved.

Philosophy reaches into the locker room, for here again you decide to what degree each user is an individual and to what degree he is a piece of animate meat to be processed by packing house methods. For instance, will you have each student's gym clothing in his own basket locker or will it be issued to him from a basket room under controlled and labor consuming conditions? If the former method, by no means the only one, is selected, a full length dressing locker, alternating with five or six smaller lockers each containing a student's equipment under padlock, is appropriate. This assumes that he is competent to remember the combination on his own lock and not lose it.



Locker room showing mechanically ventilated lockers and partial glass walls adjoining shower room Designed by Mickle-wright and Mountford architects.

A glass wall brings swimming nearer to the out-of-doors. Lawrence B. Anderson and Herbert L. Beckwith architects.



The central basket room has the advantage of more positive ventilation and control. It may even be used as a method of taking attendance. If the central basket room is used then only enough full length lockers and benches need be provided so that one period of users will be provided for at a time, it being presumed that they will have vacated these lockers before the next class comes to use them.

The individual basis requires more space in the locker room and less in the basket room, approximately a stand-off.

This philosophy reaches even into the shower room itself. A decision must be made between trusting the student to have the sense to turn the water on himself and finish with a cold shower, or putting him through a gang shower which starts hot and finishes cold; where he can't back out because the fellow behind him is between him and the door, and there is only just that much room. This latter is the "efficiency" method. It undoubtedly removes the greatest amount of perspiration and grime per gallon of water. Such pleasure as there may be in taking a shower would be distinctly dimmed, in the authors' opinion.

Either the individual or gang shower should be entered and left through a drying room where towels can be left and where surplus water can be taken off before tracking it through the locker room.

Without any attempt to get involved with the engineering of locker and shower rooms, this is an excellent place for warm walls and warm floors as a part of the heating system. Also non-skid waterproof floors and non-abrasive walls are essentials.

The problem of acoustics in a shower room is acute, particularly at the cold end of the shower. A ceiling acoustical corrective of

cement asbestos type should probably be explored for this application.

The trend in girls' dressing, shower and drying rooms is governed by this basic choice, and one additional factor—the estimate of the value placed on "modesty" by the girls who will use it. Schools have been built where the entire provision for girls' dressing and showering is in individual compartments and individual showers, so arranged that the instructor can look out over the top of the partitioned area and see the heads of the occupants. To say that this is no longer done would be inaccurate. But there is an increasing number of successful installations using the open, individual shower and drying room and locker room, similar to boys' facilities for this purpose. For the sake of the occasional girl whose training or parents require privacy, an individual dressing room and shower can be installed. In practice this is more for record than for use.

We remind the planner of this facility that here, more than any other place in the school, he is dealing with difficult conditions of youngsters at their most vigorous, and water at its most permeating. Materials must be used which are easily cleaned, have no sharp corners. Vapor-proof lamps and switches that will not electrocute people are important. The shower hardware must be safe, rugged and rust proof as well as useful in helping select the amount and temperature of water. Water vapor is not like other kinds of water. It can run uphill, too.

And a last word on design. Keep the colors light. Dark green lockers will take the cheerfulness out of an otherwise fresh and pleasant locker room.

Fieldhouses

The fieldhouse is one of the most loosely defined places of physical education equipment of which we know. Nobody has been able to tell us what one is, but fieldhouses do have some characteristics in common. Each seems to be a big, raw shed for athletics. It can be pleasantly designed, but it is still a considerably less finished and pretentious building than a gymnasium. A dirt floor is customary, although this can be varied with an asphalt paved floor or a partial floor in the middle for exhibition purposes.

One fieldhouse with which we are familiar has, as its primary function, the service of that form of physical education under the heading of "track and field sports." The governing dimensions of the building are those of a dirt running track, 10 laps to the mile long. The space inside this oval is devoted to jumping pits, pole vaulting area, dashes, straightaways, hurdles and the like. The space is spanned by three-hinged trusses, anchored at their base and going up vertically a short distance; then turning, like the boat ribs described in the playroom, to a low angle and climbing to the ridge line of the shed, where a similar member is met and opposed in terms of stress. This carries the roof and permits a low wall. Light here is admitted by a series of windows running the length of the room, let into the roof in a series of saw-teeth. These in turn are shielded by the depth of the trusses themselves so that relatively little of the window is visible to the athletes on the floor. A minimum space for spectators is provided in the corners and outside the outer rim of the track in the space gained by the depth of the trusses.

The theme and variations on this unit are infinite. They all contemplate the service of larger than normal class groups for physical education, and the direct service of such games as track and baseball. The trick here is to let in enough light at enough points so that the windows, which almost have to find their way into the end walls, will not seem contrastingly bright.

Swimming Pools

Like every other part of the building which has been discussed, the swimming pool should be measured against its objective in the education of the student body. It is very expensive, difficult to maintain, and if improperly run, a health hazard. It is not the purpose here to present the conditions of expert design of such spaces, if we knew how. This is a highly specialized branch of design. The qualifications of the expert to be consulted should be scrutinized carefully.

However, let's look at some reasons for deciding to attempt this branch of physical education. First of all, people get drowned every year, most of them unnecessarily. It may be considered a part of the school's obligation to train people in the minimum accomplishment of being able to save themselves if they fall out of a row boat. This is particularly true in parts of the country such as Western Kansas and Nebraska where there are very few bodies of water deep enough in which to get wet all over. In case this is not clear, schools have an obligation to teach people to swim, because they certainly need to know how.

One of the great state universities feels so strongly on this point that they will not grant a degree to anyone who cannot swim 60

feet. This is one important phase of the need.

The conflicting one, as always, is between the pool for people learning a minimum job of swimming and developing a degree of proficiency which will give them lifetime enjoyment versus the spotlighted athletes who are expected to swim 100 yards in less than a minute even to get on the squad. Basic points of conflict are that the expert swimmer is handicapped by having a pool, a large part of which is shallow enough to stand up in. He wants deep water and relatively great distances. He needs head room for high board and low board diving. He needs a *wide* pool with clearly marked lanes so that 6 or 8 or even 10 competitors can meet at once, and spare the grueling necessity of preliminary and semifinal heats before the main event. He needs splash gutters skillfully designed to minimize waves, which have a way of spoiling speed record attempts.

He also requires spectator space—else why put himself to all that trouble? And this puts him in conflict with the spectator himself. The swimmer to be warm should be in temperatures in the mid 80 degrees whereas the spectators in a highly humid room can be very uncomfortable at this level. This is frequently resolved by having a swimmers' "hot room," glazed and apart from the main pool room, so that they are only in the larger room, which is adjusted to the spectators' comfort, during the time their events are taking place.

These notes make no pretense to being a checklist. They merely point out the same conflict that has appeared again and again between physical education and team athletics. It is the job of the educational program and the philosophy of education of a particular school to resolve this kind of conflict. It is our job to point out that it exists.

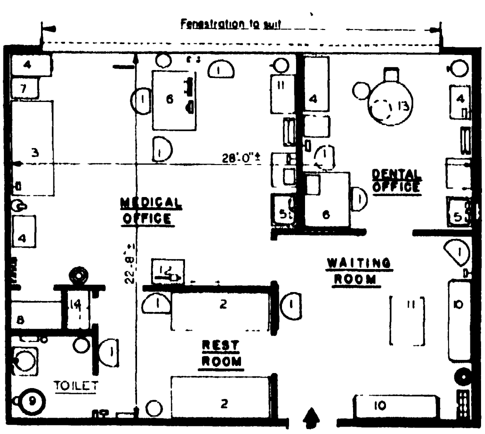
Health Education

Some hold that all students should understand the general aspects of health, and the care and respect for their bodies. Certainly health is a function of the school, and there are various aspects to the job. One phase of it is taken care of by definite instruction involving knowledge, and we hope some understanding of anatomy, hygiene, diet and the like. Facilities for this type of instruction may be shared. They have characteristics of a classroom. We mention them here because many programs relate these closely to the physical education program. This has implications for planning relationships of spaces.

But more and more schools are going further in offering actual check-up and guidance toward these objectives. A health unit in a school may include any or all of the following facilities:

- *Space for eye examinations*—principal requirement a clear space 20 feet long or else a mirror in a 10 foot room.
- *Medical examination room.*
- *Dental examination room* — complete with chair and dental equipment.
- *Rest rooms*—for students requiring prescribed rest schedule.
- *Conference room* — for discussion between visiting doctor and students or between faculty and medical and parent groups.
- *Nurse's office*—separate for examination, rest and clinic rooms.
- *Psychologist's offiice*—This is really a conference room, but it must be a particularly friendly and uninstitutional place, since one of the jobs of the psychologist in his routine work of measurement and his greater job of guidance and counsel is influenced by his working in surroundings where students are at ease and can give their confidence to him.

Should these facilities be located near the administration unit for the sake of coordination of records and ease of clerical operation? Or should they be integrated with the physical education offices? That is a decision for planners. The philosophy and program of activities, modified by the number of services and numbers to be served, specify the facilities—or have we said that before?



This health suite is a compact service center. From Manual of School Planning, New York City Board of Education.

CHAPTER 7: Building Service Facilities

We Americans don't like the word "servant." But how we love service—as an ideal (Rotary International, etc.) and in fact (gasoline service stations). We all want service. We'll pay for it. Witness the millions spent on gadgets and gratuities! But service today is a wonderful combination of ingenious mechanical devices and skilled, personable managers of those devices—and a point of view.

So with our school plant. It requires efficient machinery and competent management —and a point of view. Planning pays big dividends here—cash dividends as well as less tangible ones. The "democratic process" invites, but true economy demands that the service personnel—custodians, engineers, janitors or whatever—take part in the planning. They must have an important part in this aspect of it.

Of course there are people with short memories. They have forgotten how recently specialization has come about in school personnel. They have forgotten even why it happened. They fix their gaze on Mark Hopkins and the student at opposite ends of the log and forget the log. Today's log is an intricate and complexly controlled environment indoors and outdoors, designed and managed not just to permit but to stimulate learning and teaching. Building services, mechanical, custodial, and a large portion of the administrative, free teachers to teach. They facilitate learning.

What are these building services? Well, it's a long list. Let's start with the utilities and their distribution: water, gas, electricity. Then add the whole heating and ventilating system. Cleaning, waste disposal, supply receiving and distributing are included. So are the multitudinous and varied storages, the provision for maintenance and repair, of warning systems, telephones, clocks, programs, intercommunications. And such things as bus service and bus garages; yes, and faculty housing. All these things and the equipment to service them. And most important of all the people to manage them. These service people must be encouraged in cheerful competence. They must help plan. They must be helped by planning; today by participation, the long tomorrows by efficient service design.

It must be conceded that educational philosophies differ in this area. And these differences matter in design. There's the philosophy, usually implied rather than stated, that says the service job is a menial one. Such a feeling about service permits, even encourages, employment of the aging incompetent (sometimes even to keep him off public assistance rolls) or the political henchman, or the brother-in-law of the board member.

Another way of thinking sees the schools as business and instruction, separate and distinct, parallel but never merging. This can result in efficient maintenance, the "protection of the taxpayer's dollars," careful operation. It can result in employment of competent mechanics and cleaners who are custodians of the property in which teachers are tenants. It may result in guarding not only against abuse, but against use. It may see the plant not as a tool to be used, but as a treasure to be hoarded.

A third kind of educational philosophy counts all personnel, all services, as contributing to and being justified by the learning, the development of pupils, the growth and recreation of the community. In such a system, the custodian is part of the learning environment, the teaching atmosphere. What he is matters as much as what he does. He serves the building and grounds, yes. He conserves the time and energy of the professionally trained teacher, yes. But he also serves the children, the community directly. And he sees his function and that of the plant as contributing to educational objectives.

Take these three philosophies roughed out as they are. They're not the only ones, but let's take them as fairly representative. What do they amount to in plant design? For one thing, all demand and deserve good tools. Although the first one seems to put a low value on labor, wages are not that low anywhere. All call for labor-saving devices. They will vary in their intricacy of course. But

which philosophy warrants the installation of a gallery for student observers in the boiler room? Or provision for group observation of food handling and preparation in the cafeteria kitchen? These provisions do exist today in certain New York City schools, for example. Which warrants fireplaces? Or a smoking lounge common to all men on the staff? Or any of the hundreds of details whose installation is justified only if they will be used and maintained? Which of these details will be maintained properly only by custodians with a real pride in their school? Which by those who have a vision of their value in the educational scheme?

We do not pretend to have all the answers. But we have seen too many beautiful fireplaces which have never known a blaze of cheer. Yes, we've even seen too many mechanical ventilating systems idle at least partly because of the nuisance to janitors. Too many portable gadgets are nailed to the floor. We say that practical school administrators, practical planners, practical architects all keep their carefully defined philosophy of custodial service before them constantly in planning and designing. And note the "carefully defined." Planners would do well to explore the conflicting philosophies in all their implications. What goes on in a school is affected tremendously not only by the plant, but how that plant is served.

Let's suppose for our purposes that the philosophy is one of democratic participation and planning; of shrewd use of staff to provide the best in planned and actual service to the learning process. The custodial staff will contribute ideas, money-saving ideas. They know that the kind of building planned will need such and such tools at such and such places; that too many would not be an economy—nor would too few; that the closets should provide for efficient storage and handling of those tools. They know that in this area such and such an exposure means snow piling up and that heating coils under the front walk would prevent ice, would facilitate snow removal. They know these things. They should have the opportunity to help translate them into the design of the building. And as an end product the man who has shared in the planning will have a higher regard for the job he is there to do. He'll do that job better.

Closets

At the simplest level he should have supply closets provided with "slop-sinks," brooms, mops, paper and cleaning supplies. These should be at frequent intervals in corridors on every floor, if there are more than one. One standard indicates no more than 100 feet of corridor between any two of these. There is no saving in his having to haul mops and buckets great distances and up and down stairs. Every minute spent hauling is one less more for useful work.

Office and Work Room

He needs more than closets and storage of tools. He should have an office, a place for keeping records and a desk where he can work. One wall may hold his key rack where he can neatly label and organize all the keys and other minute gadgets which are needed "right now" when they are needed at all. He may need a place here for locking up his valuable tools. He will need a maintenance shop of a size consistent with the jobs he'll do in it. If it is a large-ish building or there are enough kinds of jobs to warrant a proper-sized room, then he'll probably keep those tools there rather than in his office. The office needs a comfortable chair, provision for seeing visitors, for conferring with other staff members. And a good shower will pay dividends. Space for dressing and clothes storage is a must. Morale, always difficult to measure, will show even more quickly in the general condition of a building than in the quality of teaching done in it.

Boiler Room

The custodian's office might well have a window opening into the boiler room, which is in reality the mechanical center and control point of the entire physical plant, if the climate is such as to warrant central heating. This boiler room should be where he has to look at it year in and year out. If he is any kind of a man at all, certainly if he is the man we've posited, it will be his pride and joy. There is something about a boiler plant complete with all its pipes and shiny valves and nice machinery that brings out the creative artist, the pride in craft, in most engineers. It is exceptional to see a neglected one where it has been worth taking good care of in the first place.

Such pride has a very real practical value and actually makes for the more efficient consumption of a pile of fuel. It encourages care which lengthens the life and gets full value out of the machinery.

A floor which can be painted and washed dead clean generates less dust to get into bearings. Pipes painted in colors appropriate to their use (red for sprinkler lines, etc.) make their purpose clear so that trouble can be tracked down with a minimum of lost time and wasted effort. Fortunately there is usu-

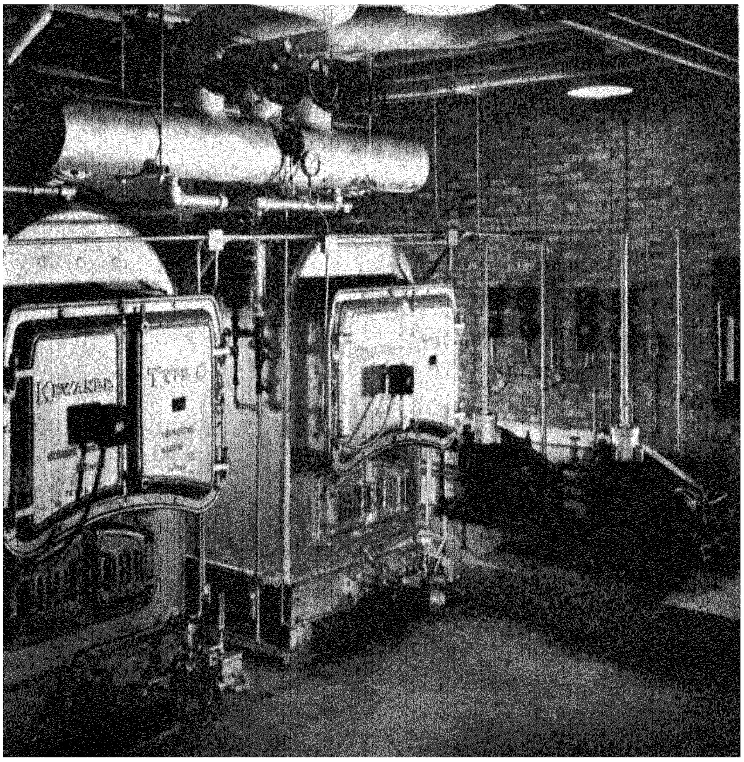
ally a school board member interested in heating. He is likely to be susceptible to a good grade of stoker, an efficient mechanical plant, just as others insist on the inclusion of an art room. A minute's reflection will show the similarity of the appealing instincts.

Authorities in the State of Michigan feel very strongly that the heating plant should never be under any part of the teaching spaces. They point to the record which shows that fires and explosions usually start in this vicinity. Parenthetically this is a strong argument for the high grade custodian and the well kept boiler room. But whether this room is to be included in a separate building, or at least under its own independent roof, it should have ample outside light. Grim though the thought may be, the windows should be provided in such a way that they will be what gives in a minor explosion. There should be space in front of the boiler at least equal to its length. Replacing tubes is an arduous task at best. If a piece of wall has to be taken out every time a tube needs changing, that does not make it any easier or cheaper! And space above the boiler will save endless energy in working on pipes, stack, boiler cover, etc.

This is a very embarrassing place to have a flood. While it is desirable to have heating returns at a relatively low point in the building every provision should be made to see that water cannot come tumbling down a driveway or otherwise flood into this area. Adequate pumps should stand ready to take care of the unexpected.

Heating, wiring, plumbing seem to be here to stay. They were not part of the design of traditional buildings—certainly not at the time those traditions were being acquired. They are as integral a part of a contemporary building as the walls or roof which have received so much more design attention. Those pipes are there. They should be included as a conscious part of the design just as the meeting rail of a double-hung window, or the trim around a door. The neatness and order of the boiler room itself should be contagious, should catch hold of the whole mechanical part of the building in the interest of successful esthetic design. Such design will probably be good mechanical design, too. A return line from a radiator may be either an awkward thing with lumps and twists, or a clean intentional looking thing lined up with other elements in the room, such as mullions and sills. In the latter case it will achieve the same esthetic acceptance as the rigging on a boat which is of similar utilitarian purpose. There is nothing about the shrouds and sheets of

Boiler room, Crow Island School, Winnetka, Ill. Boilers were salvaged from an obsolete school building torn down to provide needed municipal parking. Perkins & Will architects. Hedrich-Blessing photo.



a sailboat, for all their esthetic effectiveness, but derives fundamental appeal from fitness in holding up the mast and controlling the sails.

To carry the application to the building, boilers cause exhaust gases called smoke, which must be vented to the outdoors. The choice lies between whether this is an unpleasant necessity or an esthetic opportunity. We like chimneys. It seems pointless to look around for architectural opportunities to secure vertical emphasis and a climax point for exterior design when here is one that has to be built anyway.

By no means do all buildings need boiler plants. In many cases, particularly in the milder climates, individual room heaters or a furnace included in the janitor's closet between every two rooms may be the appropriate way to heat the building. (See Chapter 5.) Our emphasis here is on the more usual.

Pipe Trenches

Nobody likes to go down a two-hundred-foot pipe tunnel four feet high on routine trips of preventive maintenance. The chances are that most humans will find reasons to procrastinate on such a chore and will be induced to bang their heads and bark their shins only in a major crisis, like Mama Skunk's taking up residence in the tunnel. This can be helped. A series of trap doors in the floor above, or the walls beside according to location, at intervals of forty or fifty feet will make the job less arduous—and better done.

Roof Openings

Much the same as above applies to roof openings. If there are different levels of roof, there ought to be a way of reaching each such level from the interior. Snowy gales, or sheets of rain, do not make climbing any easier. And unfortunately those are just about the conditions when someone has to look at the roof.

Receiving Room

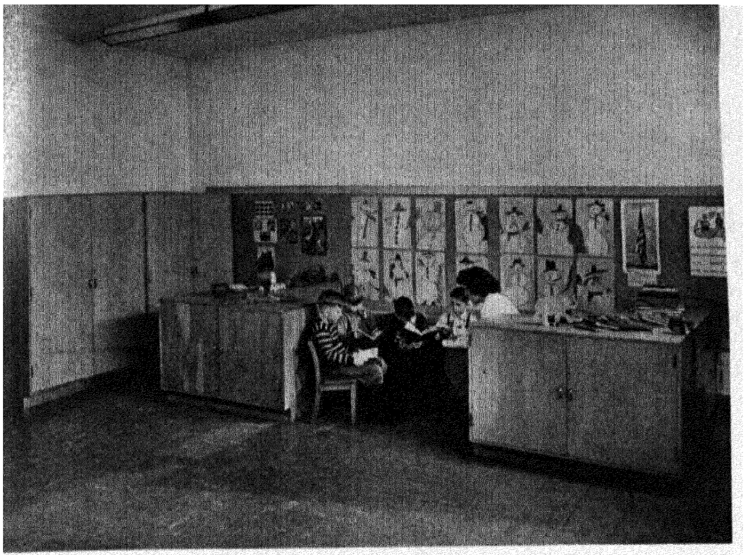
Bulky goods are always coming into and going out of a school building. Coal and oil are by no means the only things that are delivered. There are desks, cafeteria supplies, paper (surprisingly heavy) and a host of items which need care and which should not come in through doors reserved for people's access. Therefore the receiving room and the receiving platform are a part of school design to a lesser degree but just as inevitably as in a manufacturing operation.

One scheme is to put a loading platform the height of a truck bed, so that the hand truck of the building can be wheeled onto the bed of the truck and vice versa, near the mechanical plant and near where the custodian can take charge of goods received. And these trucks have to be wheeled onto the floor of the building, too, remember. Immediately available to that platform should be a storage room for the handling of these bulk supplies. If the building is a multi-story affair, then the elevator or dumb-waiter should be handy, too. Mechanical means for hoisting material from floor to floor can pay for itself over a period of years in even a relatively small building.

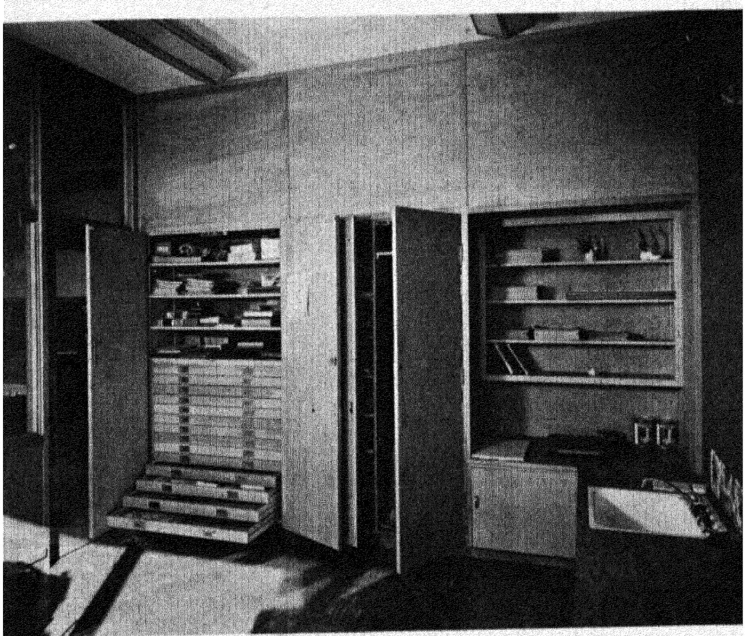
The court where delivery trucks come should be adequate in size so that some of the more unsightly and rougher phases of building operation and maintenance can be conducted there. And, very importantly, this court should not be approached by drives which cross major student traffic lines. Schools are not like houses where you buy a sofa only once every twelve years and a grand piano once every fifty. You can put up with a good deal of inconvenience at those intervals.

Housing Grounds Equipment

While we have our heads outdoors, let's look for the power-mowers, or the snow-plows, or the movable backstops, hockey goals and what have you. Where are they kept? There's something a little incongruous about a lawnmower in a snow storm! All schools do not have huge stadiums with dry clean storage below. Provisions have to be made. Rollers, gang-mowers, hand-mowers—the list can be long. Goal posts, movable bleachers, benches. Whatever is used will have to be stored. It certainly will have to be repaired and maintained. Sand, clay, loam, fertilizer, grass seed, cinders, sawdust, lime for marking—all need bins. Weed-killer, grease and oil, gasoline require safe storage. Paint, too. Our job is not to supply the list. Neither is it the architect's. Planning does it. And the groundsmen who share in the planning will do it. Our point is that grounds, like the building itself, get wear, get use, are part of the educational plant. They need efficient machinery, competently handled. They need service. Like buildings, they wear out quickly without it. And a jumping-pit cannot be dug once and forgotten. New sawdust has to be raked in, new clay on the runways. All by people, grounds custodians. Let them help plan the place to store, to repair, to house the tools, supplies, and equipment. They'll



Cabinet storage is often practical in the lower grades where children work with a variety of things of varying sizes, more than with books. And it can be combined with working surfaces, as in this kindergarten at Drexel School, Cicero, Ill. Perkins & Will architects. Hedrich-Blessing photo.



Planned cabinet, shelf, and drawer spaces take the clutter out of the problem of storing things. Drexel School, Cicero, Ill. Perkins & Will architects. Hedrich Blessing photo. Below: Storage can be organized and personal and out of the way, as in this example at the Sunnybrae School, San Mateo, Cal. Franklin & Kump architects. John H. Lohman photo.

do it better than we. It does not have to be next to the boiler room—nor in a distant shed. It does have to be located near where it will be used. And the same precautions for service yard and drives are required to make them safely accessible.

Storage

Every human who has built a house has demanded unlimited closet space. Every teacher who has ever participated in a school plant plan has sung the same refrain. It seems almost impossible to overdo storage in all of its ramifications. Those parts of storage which pertain to the instructional function directly have been discussed elsewhere as part of classrooms, gymnasiums, etc. In every case, storage space costs plenty. It costs as much per square foot as the open rooms it serves and this goes even more strongly for the general storage that any building however minor requires. Where do you put the desks that you hope to have refinished some summer? Where do you put the sets for "Alice in Wonderland" that you're not planning to give again for three years? Where do you put all the things that used to be put in the attic in homes, when houses had attics?

A bonfire is not a satisfactory answer. Some unassigned basement space is one answer (if there is a basement). Space under the bleachers for hurdles and high-jump standards is another. The discipline not to own or to discard needless things is a third—rarely employed, and never the whole answer.

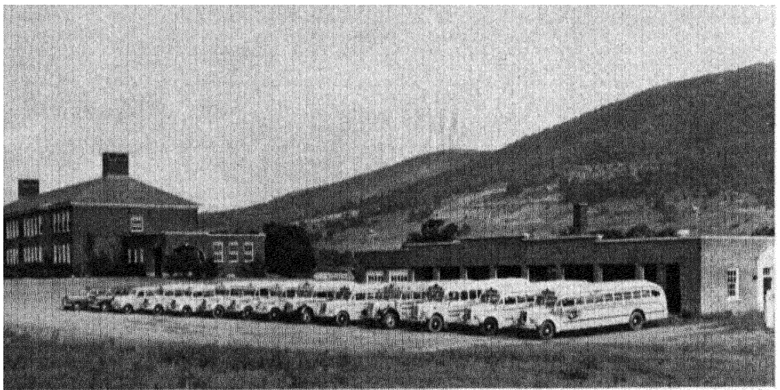
No rules of quantity can be offered—only the advice that these unforeseeable and unassigned storage requirements of bulky materials are surprisingly burdensome. Any planning should include some "space left over." You'll need it. It'll get used.

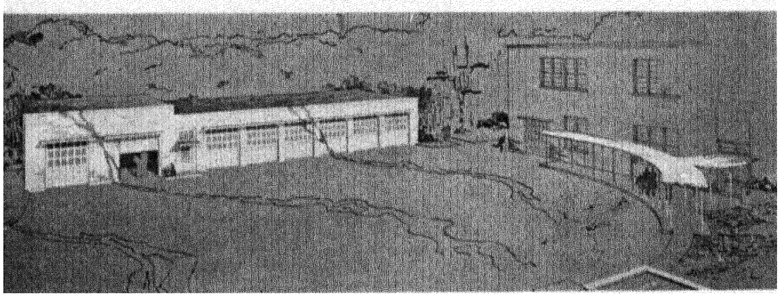
Bus Garages

Nearly 100,000 vehicles carry more than 4,000,000 children to and from school each day. And the job is not yet done. Those buses cost $500,000,000 in the first place, and they have to be maintained and replaced. This is big business and gives rise to a new building element in the school lant—the bus garage.

Keeping these buses rolling is a much larger problem than merely sheltering them at night; in fact this is the more minor phase of it. Maintaining the buses to the ends of safety and comfort for the children, and efficiency and economy for the mechanical equipment itself, requires special equipment.

Buses are important to central schools and must be housed and maintained. Courtesy *The American School and University.*





Designed to harmonize with the school building, this garage does double duty.

A bus is much like any other automobile except that it is big and the responsibility for life and limb is greater. The job of taking care of it is important enough so that a planned program of maintenance is economically feasible. Buses have to be greased, washed, repaired, painted, the upholstery repaired. Since they are a business as well as a utility, the money spent on them and the income derived from them must be accounted for, necessitating an office. This work is done by people who have to be provided with a place to rest and bathe. The National Council on Schoolhouse Construction has issued a guide for the planning of bus garages, and for detail the reader is referred to it.

It underscores the importance of this facility in the case of consolidated schools where huge areas are brought together to provide the school services that could not be as well done in a series of one-room rural schools. This is accomplished by means of an organized program of transportation. The Council points out that care of buses may be merely repair and service, or it may add the function of storage to this, or it can be storage only. Climate, the local garage situation, and money, influence these decisions. Nobody has suggested that buses are pretty standing out after hours.

While a small garage for two or three buses can be located on the school site or even as part of the school building itself, larger facilities for 15 or 20 buses are probably better off on a site well separated from the school building. If it is located on the school site, the possibility of getting some educational use out of it by making it do double or triple duty as the auto mechanic's shop, the farm shop, or some other function requiring a big piece of rough space during the daytime when the buses are away, is worth investigating. Like the delivery and receiving function of the building, the line of traffic should not cross the approach or recreation areas of the school.

Again, buses are big. They require 90 feet minimum diameter and 110 feet preferable diameter for turning purposes. This should be weighed seriously when cutting into a limited school site.

On the assumption that the building itself is only a direct simple sort of an affair, it should not be too difficult to harmonize the design of this facility with the school building if it is to be part of the same site development. The same machinery that appears elsewhere in the building can be used with less finish than would be required for some of the more polite parts of the building.

Gasoline and oil burn vigorously, and this should be kept in mind when selecting materials for the structure. Wood is inexcusable and sheet metal not much better. Exposed steel in the roof is permissible as long as the Board is fully advised that a reasonably hot fire will destroy a steel roof. That roof, by the way, should be strong enough to support an overhead track to carry tackle and lift out engines and carry on other heavy operations. A concrete floor should be vigorously pitched and drained so that people will not have to stand around in puddles of water while they work. Grease penetrates and stains, and every floor hardening measure that can be taken will probably be profitable to resist this as much as possible.

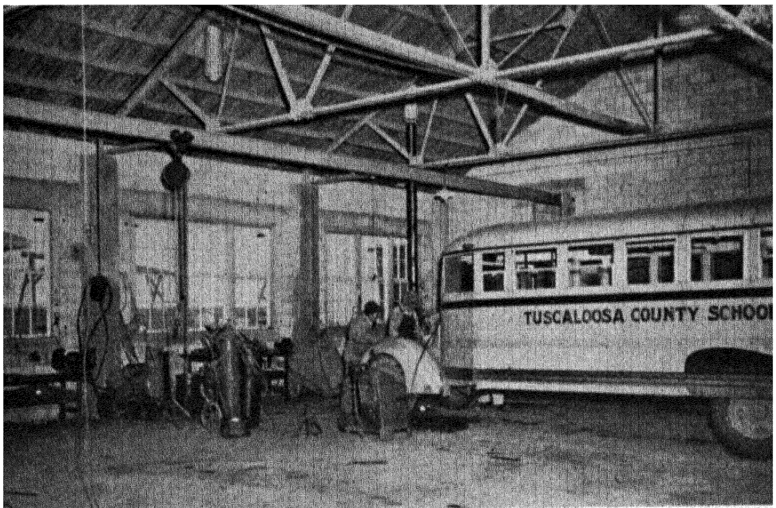
Depending on the number of buses to be housed, several plans are possible. The designer should keep in mind that overhead doors are expensive, and that their number can be reduced and other costs kept in line by placing the buses in tandem—one behind the other—so that three doors will do where six would otherwise have been required. This means a depth of about 75 feet instead of 40 feet.

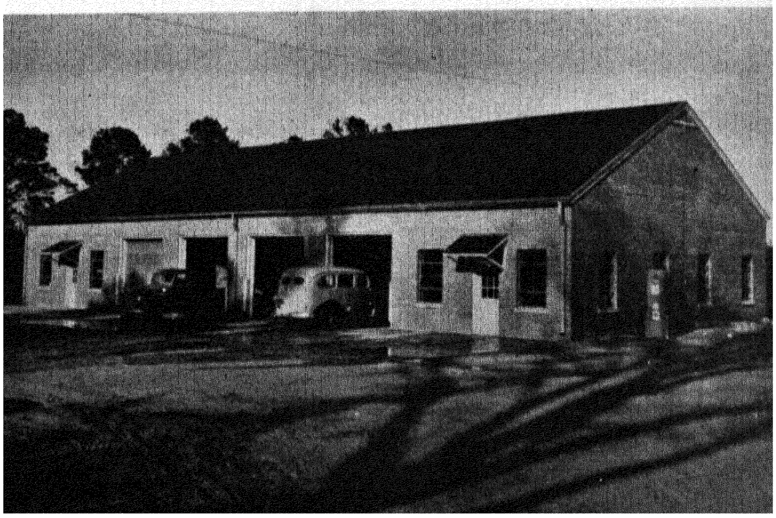
Another planning point: Repairing and washing require space to walk around the bus. Storage does not. Twelve feet wide for storage--16 feet wide for washing or repairs. In bigger operations the facilities of stock room, tool room, office toilets and showers should be added in proportion to the required personnel.

Greasing can be done in either of two ways. You can lift the bus on a hydraulic jack, which requires a high roof. Or you can get under it with a pit, which saves roof height, but which with the best intentions will probably become foul. The reader is referred again to the National Council's detail on how to handle this facility.

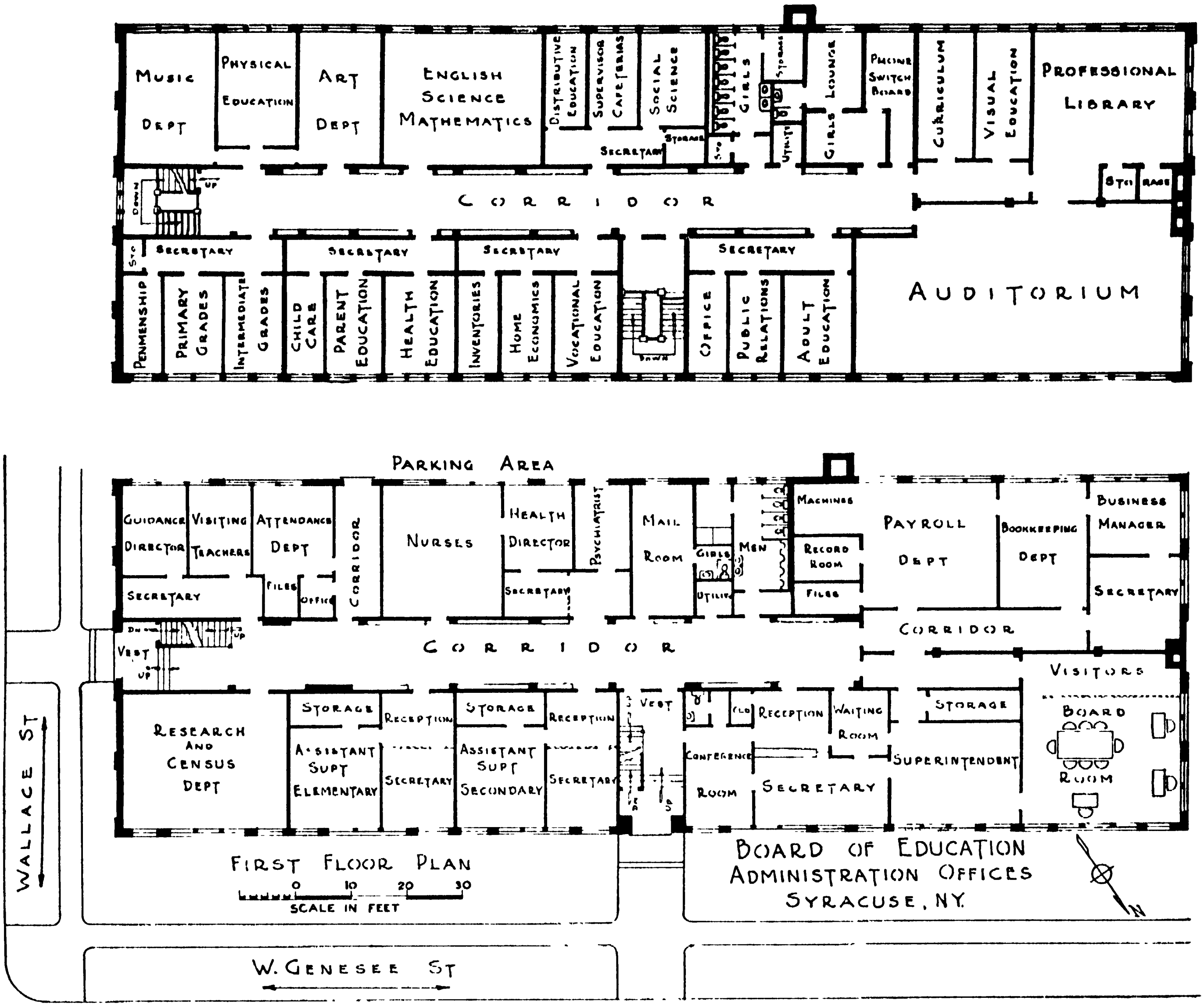
It cannot be emphasized too strongly that a bus garage or any garage for that matter is a place fraught with hazards—fire, carbon monoxide, explosions—to mention a few. Exhaust gas should be positively removed and the building generally ventilated through the roof. Heating need not be carried to as high a level of comfort as in buildings where the occupancy is less active, but this is probably an appropriate place to study the benefits of floor heating. Welding is one of the elements of repair service and requires a heavy gauge electric service, the design and handling of which should be left to experts. This is dangerous stuff and should be laid out under the supervision of the power company which will provide the current.

School buses need maintenance and a place to do it. Courtesy *The American School and University.*





A repair shop for buses requires the same care in planning as a classroom



First and Second floor plan, Board of Education Offices, Syracuse, N. Y.

Better work will be done if there is enough light to see by. The Council suggests a 10 per cent minimum with preference for a very much higher amount, if possible. The application which we suggest is that the wall be carried up as high as a bench and tool rack in back of it require, and everything from there to the ceiling be windows which will flood the upper part of the room with outside light. A substantial percentage of this area should be operative for ventilation. Overhead doors are preferred because they do not ice up in the winter, and they are out of the way when open. They should have wire glass at eye level so that people will not run into each other when the doors open suddenly.

Another possible activity of a bus garage is painting, the essential conditions of which are adequate light by which to see, and the ability to close off the painting area from the rest of the room to keep dust away from the paint and paint laden air away from the welding torch.

The authors have devoted this much space and attention to what seems like a minor phase of the school plant for two reasons: (1) It is not minor, as established by the

first paragraph. (2) It has not been built very much since the greatest period of consolidated rural areas was only well under way as of 1948.

Central Administration Building

If a superintendent has his office in one of the school buildings of a several building system, trouble may well ensue. The superintendent will inevitably be asked to handle matters that belong to the principal, and the principal's position will be made intolerable thereby. This is particularly true if the superintendent's office and the principal's office adjoin the same clerical general office. This is a negative reason for a central administration building.

A positive one is that it is an administrative function with needs of location and type of operation, many of which are not appropriate to the location and operation of the individual school buildings. Many school systems in the course of expanding their sites have acquired improved property which has a house on it, and the superintendent and his staff have found their way into that house for a period of years, the dining room becoming the superintendent's office, etc. This leads to makeshift arrangements, but administratively it is preferable to interfering with the day-to-day routine of a particular school.

Another inexpensive source of central administration buildings is the remodeling of an obsolete school located too near the downtown area for use by children, but still structurally susceptible to improvement for this adult use.

The full function of a central administration building is to provide a place for board meetings, a central place for records, the superintendent's personal and administrative offices, the supervisory offices, the system's maintenance administration, a central distribution point for supplies which can be bought more conveniently in bulk, a visual-aids library, a central distribution point for particularly expensive equipment such as the projectors, etc., and finally a place for meetings where parents and Board may discuss general educational policy and other civic policies of the community. In one such building the Board meets at a table on the platform of a sloped floor assembly room, where 200 people may sit and listen to the deliberations of the Board (which meets as a Committee of the Whole in an adjoining room when necessary). This room is always available for talks by visiting dignitaries or any other appropriate group.

Faculty Housing

The cardinal virtue in faculty housing is that it should not be different from other housing in the community. One of the great problems in education is the social status or lack of it which is accorded to the teaching profession, and any differentiation of faculty housing from other kinds would tend to accentuate this already difficult problem. That faculty housing is mentioned at all is because of necessities and emergencies rather than the desirability of schools getting involved in the real estate and housing business. We are thinking particularly of public schools in this regard.

At the close of World War II the housing shortage was so serious that many Boards, in order to staff their schools, had to resort to the device of building housing as a part of the salary inducement. Many states have given permissive legislation to make this necessity a legal possibility.

There is a case for faculty group housing like the Vickers Close of Wells Cathedral in England and the faculty apartment buildings of many major universities. The positive gains are in the form of esprit de corps and closer living acquaintance within the faculty itself, although these may be offset by the intramural politics which such closeness can engender. In isolated situations where a whole school has to be created, where not even a city exists nearby, housing must be provided as a matter of course. But the point of view of this chapter is aimed toward the more normal urban, suburban and rural situations where faculty members should simply be members of the community, and their housing as indistinguished as possible from the better housing of that community. If such housing is built, it is strongly recommended that it be done in such a way that when conditions permit, it can be sold off into the general market when the Board feels this is desirable.

It is to be hoped that faculty housing will have one different characteristic from normal housing; namely, that a book shelf will still be a necessity.

CHAPTER 8: Technical Aspects of Educational Buildings, Part 1

Lighting

We have become a civilization of people whose visual world is within arm's length. This change has occurred in less time than the wink of history's eyelash. Until the very sudden changes of the Industrial Revolution the principal burdens on the eye required far-seeing and middle-seeing. The farmer in his field, the sailor on his ship, the hunter in the woods, all these had tasks which put a premium on accurate distance seeing.

Therefore, we have brought to the problem of a world centered around near visual tasks an eye which has been conditioned for thousands of years to do its best work from 15 feet on out to infinity. Evolution may adapt the eye and the human body to its multiplicity of new jobs at near distances. In the meantime, the task of architects and lighting engineers is to design an environment that not only will help mitigate this maladjustment, but will provide visual comfort as well as visual efficiency.

It has been said before, and we will say it again: The emphasis in lighting is changing from *how much light should we have* to *how well can we see.*

The cue to good seeing is found in two others Q's—quantity and quality. And the more important by far is quality.

Quantity of light is important because some amount is necessary. Russell Putnam calls it the foundation on which good lighting is built. But good seeing conditions are more dependent on the quality of lighting, and that means control of light regardless of the amount or the source.

We see from *reflected* light far more than we see from direct light. Thus the surfaces from which light is reflected are all important to good seeing conditions.

Probably for the reason just given, no one is now prepared to say precisely what are the absolute best conditions of good seeing for close visual work. We know that factors such as intensity, diffusion, brightness differences and ratios, direction and color of light add or subtract from the desired comfort and efficiency, but we are not prepared to say how much of each. Educators, health specialists, lighting engineers, architects, and others are working on this problem, and much promising experimentation is under way.

Among his voluminous works Luckiesh has said many things, one of which forms the basis for these notes: that the most rapid deterioration of eyesight occurs during the years when nearly perfect babies are being converted into less perfect college graduates; i.e., the school years.

The situation is not a charge upon the eyes alone. Dr. Harmon has done some interesting research which tends to show that improved classroom illumination can improve both physical health and mental aptitude. In a series of experiments in the Texas Public Schools involving more than 160,000 children in 4,000 classrooms, comparatively simple changes in lighting intensity, direction, and brightness contrasts were accompanied by decrease in eye troubles among the pupils involved, and incidence of nutritional and some other ailments seemed to be lower during the test period.

Granted that good lighting fosters the ability to see well is a good thing and important, it is also worthwhile to look into some of the design elements involved. We do not know yet what is the absolute best, but that does not excuse us from studying those arrangements in the field of better seeing which seem to be better than others.

The obligation to provide good daylight for little children's schools is greater than that where much of the seeing will depend on artificial lighting anyway, although each must be well done.

Let us accept as a goal that good lighting, as applied to a classroom in particular, should meet several requirements.

It should be adequate in quantity. It should be directionless. In other words, a student should work with equal comfort facing in any direction in any room. (This goal is very difficult to achieve.)

It should be delivered in a field of limited contrasts. Glare, among other things, is a function of contrasts and is best illustrated by driving against automobile headlights at night. An application of this principle to a classroom is the contrast provided in a window wall interrupted by large brick piers, as is the case in normal, traditional buildings.

And psychologically, we want it cheerful. This is primarily a function of color.

These are the objectives.

Everything that's done in natural lighting and everything that's done in artificial lighting should be measured against them.

Dozens of things modify the effectiveness of any system of natural light. The design and placing of windows is only one, although an important and conspicuous one. The basic thinking behind lighting in a standard unilaterally lighted classroom is the result of an averaging process.

Codes exist, and although they are being rapidly modified in many states, the waning majority is designed around a set of conditions which existed before good artificial light could be called to the aid of pure natural light. The lighting standards for the common and interminably repeated classroom are based on the assumption that a window will deliver adequate light twice as far into a room as its window opening is high, which has an element of truth in some rooms, in some latitudes, at some particular minutes. It takes no account of clouds, interior decoration, trees, sun angles, but it does respond to the need for a compact multi-story building where only one side of each classroom is available for windows and where electric lights are not yet accepted.

A corollary to this is that all students will sit in orderly rows at fixed desks facing a teacher, and that the best light for normal visual tasks of reading and writing comes over the left shoulder. The requirement of modern curriculums for a wider range of activity and an infinitely freer arrangement of seating patterns is one of the factors which offsets the thinking behind the unilaterally lighted standard classroom. Another is the somewhat disproved suggestion that light is always best coming over the left shoulder. The reader's attention is directed to the next left-handed person he meets. Watch him write and see if you can think of a more awkward direction than from over the left shoulder. This is part of what is back of the condition "directionless" in the set of conditions suggested at the head of this chapter.

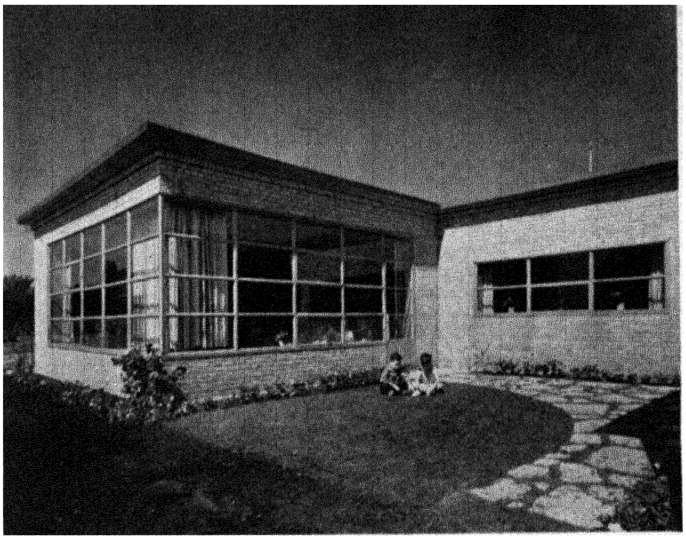
If unilateral light is not ideal, then what is? Answer: No one really knows yet. However, there are great improvements within our power over the standard unilateral lighting for classrooms under most conditions. The end product of good natural lighting is the light achieved under the shade of a wide tree, the old apple tree of song or of Isaac Newton presumably, with natural light coming from 360 degrees, and the direct sunlight filtered out by the leaves. The light level will be high, the contrasts provided by nature low, ventilation presumably very adequate, and nearly complete reading comfort will be achieved. Obviously, this is unbuildable.

The scene depicted has been incompletely described. It is, of course, possible for the leaves of the tree to start high enough so that there would be too much sky glare. It is possible for the tree to be on the edge of a sandy beach which would illustrate excessively bright surfaces within the field of vision again. Our apple tree must have relatively low hanging branches, and the part which is most demonstrable is the ratio between the light falling on the book and the light falling on the grassy surface immediately surrounding it in the visual field.

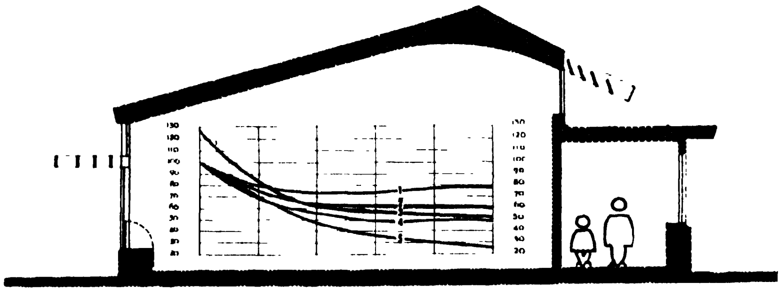
Bilateral, trilateral, multilateral lighting, in all of their modern multiplicity of forms, are attempts to compromise this ideal with the facts of practical construction. It is necessary to warn, however, that such problems are not for the amateur. The best lighting engineers should be consulted and their approval secured for the design proposed as the best solution. Even today, too many are proposing multilateral lighting without understanding the multitudinous problems which are thereby introduced.

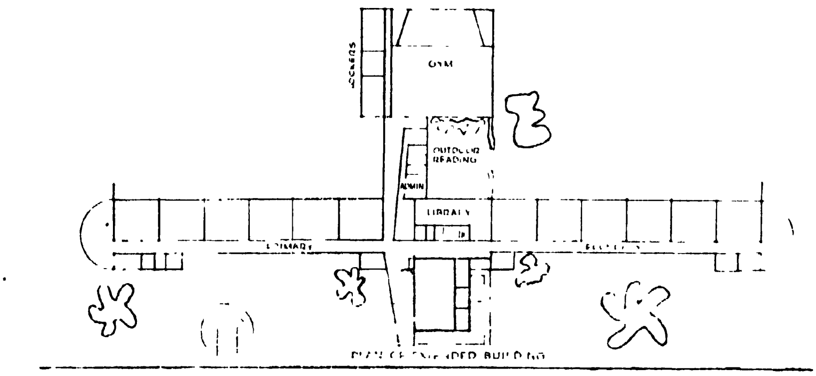
Glass has been cheap, abundant, good and getting better, since about 1900. Much of the progress of architecture in general and school architecture in particular has followed the increasing understanding of its growing possibilities and uses.

Bilateral lighting has been the subject of

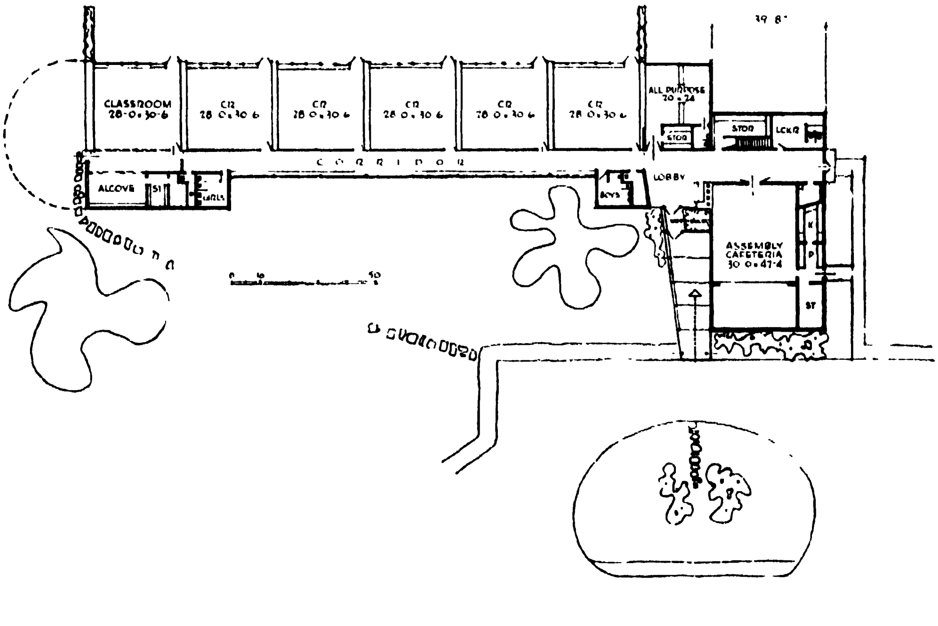


Bilateral lighting at Crow Island, controlled by curtains. Crow Island School, Winnetka, Ill. Eliel Saarinen-Eero Saarinen, Perkins, Wheeler & Will architects. Hedrich-Blessing photo.

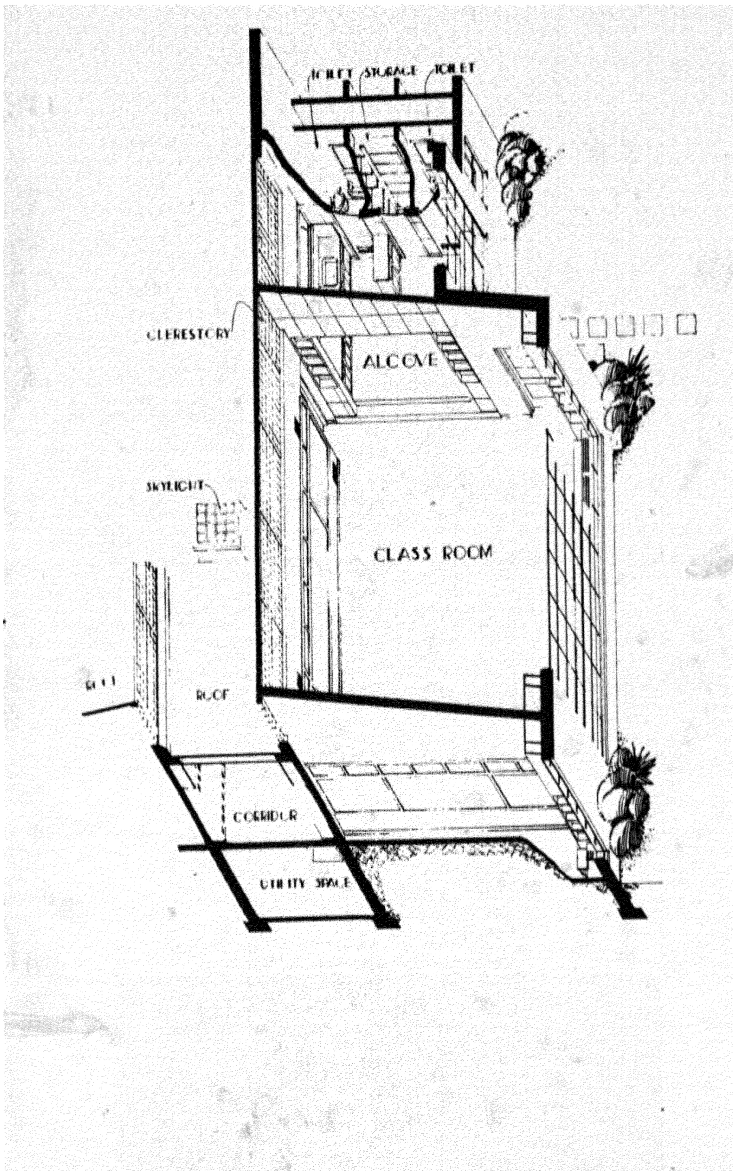


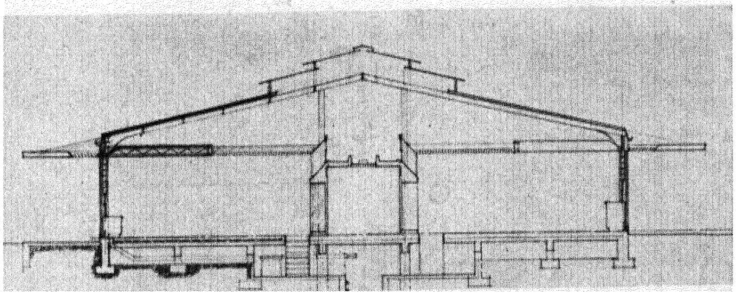


Advantages: very flat, high, light curve across room; brightness differences held within 10:1 ratio in any direction at all times; generous view outdoors—feeling of spaciousness; no adjustable interior controls to be watched, operated, or maintained; no adjustments needed of exterior controls; warm south light in all rooms at all times (reflected sunlight); no solar heat problems in spring or fall. Elementary School, Clarksville, N. Y. Henry L. Blatner architect. George Teeling mechanical engineer.



Directional glass block in clerestory provides second source of light for this classroom unit. Designed by Britisch & Munger, Toledo, Ohio.





An ingenious solution of the problem of exhausting air from and getting light into the classroom and corridor. James Henry Bailey architect.

shiploads of printed matter. It has many forms and is much simpler than the technical word suggests. It means putting windows in more than one wall—in two walls to be precise. This can be done by carrying windows around a corner and is not a particularly new discovery. Many of the buildings built around 1860, where there was a room on each corner, took full advantage of this, and within the limits of their times, did it quite well. The limit on their success was the fact that the windows themselves were not large, and the piers which interrupted them were. While they delivered light from a wide range of directions, the "headlight" effect was pronounced.

The Crow Island School in Winnetka is an example of a building where windows were carried around corners to bring natural light in from two walls. This at once created the effect of a vastly larger room, and the liberating psychological sense that goes with it. From the purely engineering standpoint it has not been conspicuously successful in delivering large quantities of daylight into the corner opposite the junction of the two windowed walls, nor of making directionless non-glare lighting a reality.

The bilateral lighting in the form used with such conspicuous success in the West and Southwest has also been used successfully in the more rigorous climates of the Middle West and Northwest states. In this case, natural light is admitted through opposite parallel walls. It is achieved by lowering the corridor roof and raising the classroom ceiling to a point where a clerestory containing windows can be worked out. There is no question that as far as delivering light onto desks, this design now out-performs the bilateral lighting achieved by the windows on two adjacent sides. This is an important, but not the sole factor, in judging between them. Parenthetically it may be added that acoustic conditions are improved by the sloping ceiling.

The esthetic problems generated by the excessively high ceiling or the sloping ceiling necessary to achieve this clerestory effect are not easily solved. (Excessive may be taken to mean ceilings over 9 feet, unless specific equipment forces greater height.)

Another variation of bilateral lighting is the one-story school with classrooms on each side of a corridor, where the corridor roof is depressed and, in effect, a trough runs the entire length of the building between the two rows of classrooms, thus providing a place for natural light from two sides without the loss of corridor efficiency. And shorter travel is accomplished by what is usually called "dou-

ble loading" of a corridor.

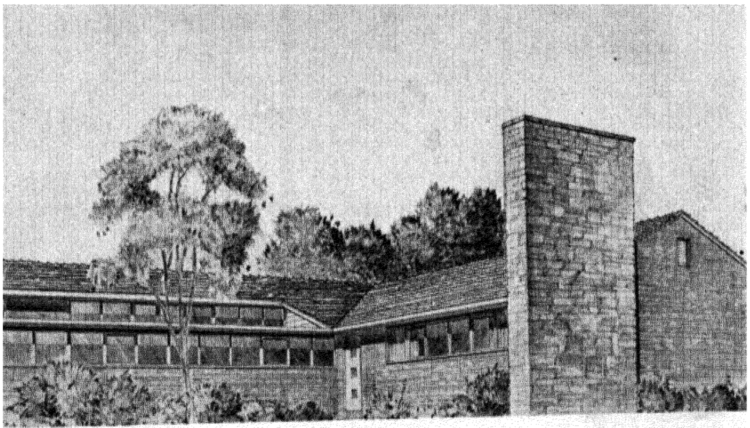
Still another variation which has advantages under some conditions is more nearly a series of steps, where the clerestory is designed to throw light against the back wall of the classroom, but is actually admitting light from the same direction as the main windows. Subjectively this does not seem to deliver as cheerfully lighted a room, although the rather impersonal foot-candle meter shows some very satisfactory distributions of light by this method. It has the sharp advantage of making possible a room which apparently has a low, level ceiling in scale with its occupants, and the high part of the room does not intrude itself into the esthetic consciousness of the beholder to a disagreeable extent.

Toward the goal of the old apple tree, several designs have been proposed where the classroom is, in effect, a peninsula; it is hung as tenuously as possible to the corridor and projects so that light can pour into the room from all sides. We have seen rooms that have been designed on this principle and note that the sheer abundance of light at once reduces contrasts and minimizes the need for light controls.

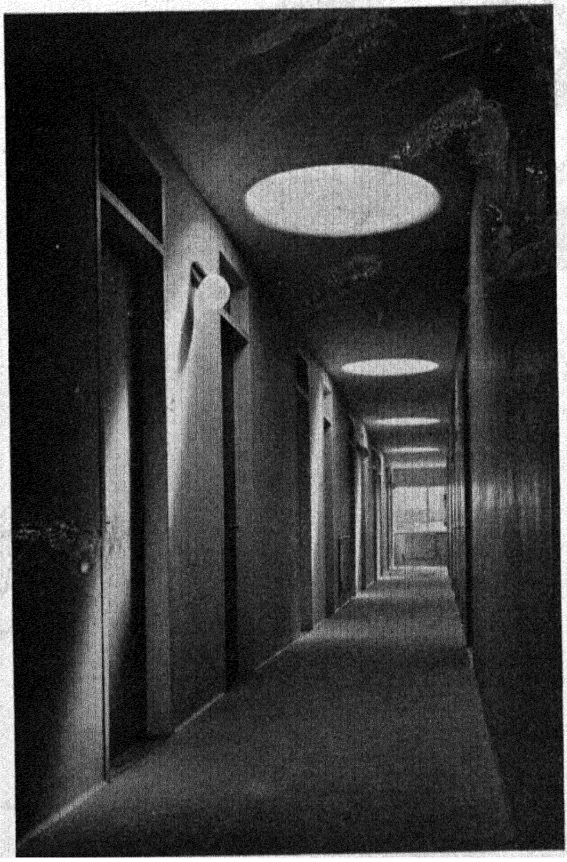
This design raises such practical problems as where will you put the bulletin board and chalkboard, and how do you handle them without facing the light. A host of answers suggest themselves, such as directional block above the bulletin board, louvers in the same position, or overhangs which permit windows to admit light but prevent the student from looking up into direct sky glare. The devices for accomplishing light control should necessarily be designed to meet local conditions.

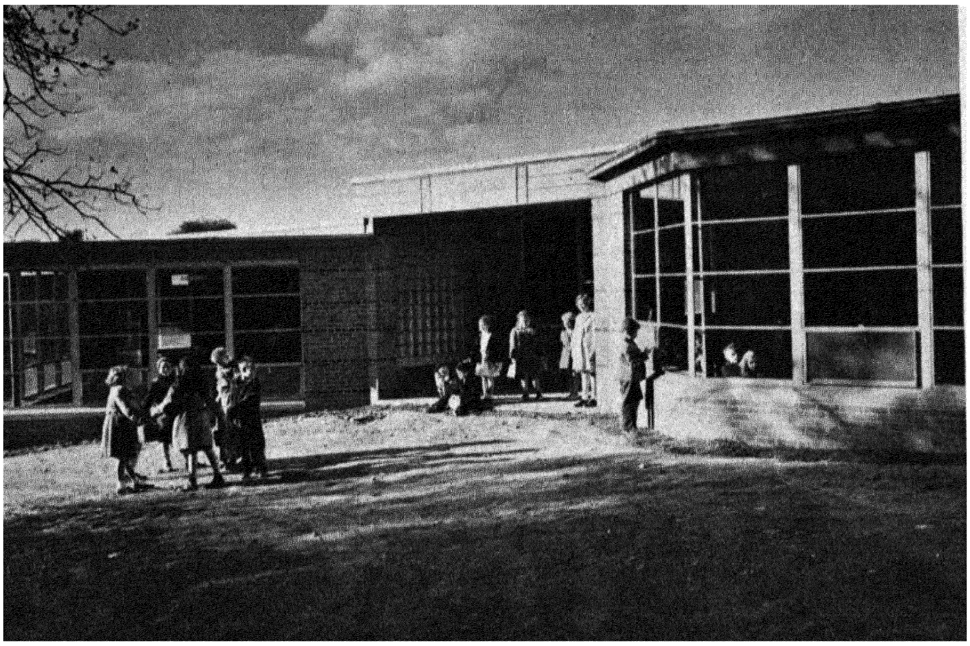
In theory at least, a skylight suitably controlled, supplemented by windows adequate for view and esthetic achievements, should be ideal. The firm of Kump and Falk has designed a particularly interesting variation on this idea, using a skylight above an "egg crate" louver, which pours abundant, glareless daylight into every corner of the room. This is obviously a device which has to be used with vast knowledge of local conditions, since skylights can be among the most troublesome maintenance elements in the building. And don't forget that if you have controllable louvers, the teachers will get tired of using them or forget how long before the building has run its course. There is a school in the Middle West, now in its 30th year, with a skylight, adjustable louvers and a glass ceiling hung below it. It was a good idea at the time. It still works perfectly but is a failure, not

Clerestory lighting achieved in building with pitched roof design. Clyde Lyon School, Glenview, Ill. Perkins & Will architects. Hedrich-Blessing photo.

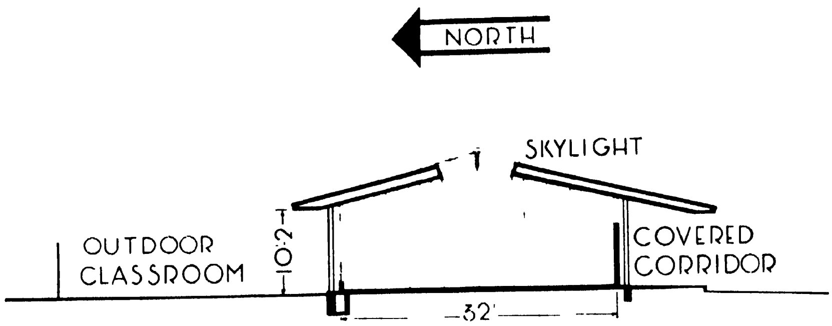


Ceiling "portholes" keep this narrow corridor cheerful and safe with sunlight. William Lescaze architect. Dell and Wainwright photo.



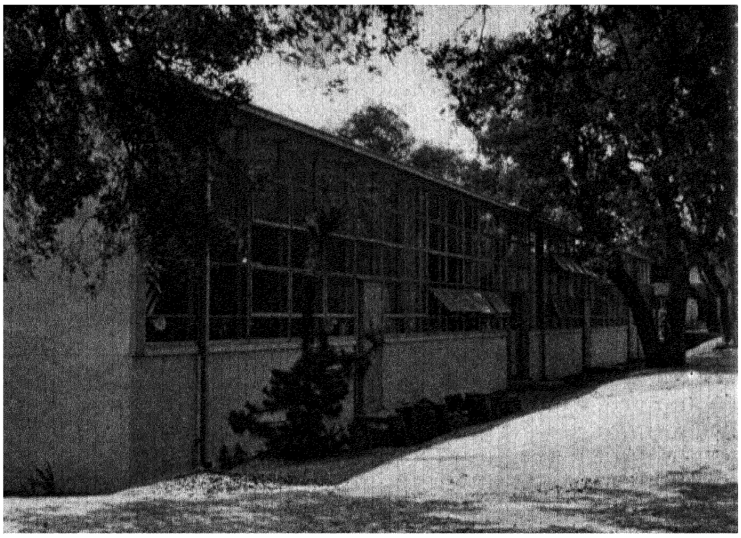


Classrooms that project out from the corridor bring light from two and sometimes all sides. Elementary school, Mt. Pleasant district, near Wilmington, Del. Allan B. Stanhope architect. Willard Stewart photo.



Franklin & Kump use skylight to provide a third source of natural lighting in the Laurel Elementary School, San Mateo, Cal

only because it leaks, but because the faculty, which has been changed at least six times since the building opened, has no understanding of how to use this gadget. Furthermore, it gets dirty, particularly the glass ceiling below the louvers, and the maintenance funds and the interest to keep it in fresh condition have not been forthcoming. Extreme temperance in the use of skylights is advised.



North light—lots of it—by means of continuous fenestration at La Canada School, Cal. H. L. Gogerty architect.

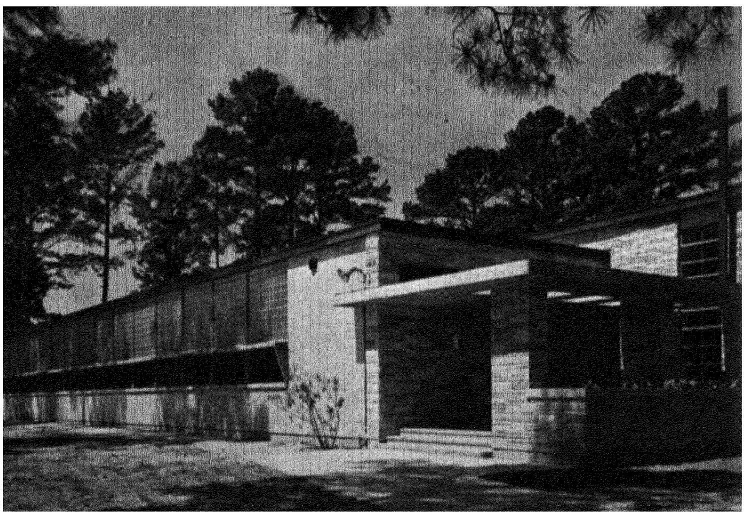
Orientation

A case can be made for putting any room at any point on the compass, if you don't specify the site on which the building is located. In the Southwest desert country it has been found expedient to have the principal window wall of a building pointed not quite north, but a little bit west of north—perhaps 20 degrees—so that the morning sun will not overheat the room by the time it is to be used. Conversely, in North Dakota, where every bit of solar effect should be seized upon for the sake of the coal bill as well as for pleasant quality of light, an equally strong case can be made for turning that same wall due south or slightly east of south. In temperate climates where a reasonable amount of pleasant daylight can be counted on and a conventional double-loaded, unilaterally lighted school is assumed, a very strong case can be made for a corridor which runs north and south so that the classrooms will face east and west. This is to avoid north classrooms which can be cheerless and unpleasant, and as the New York State regulations once admonished, it will provide for "flushing" out the rooms on both sides of the corridor with sunlight at least once a day.

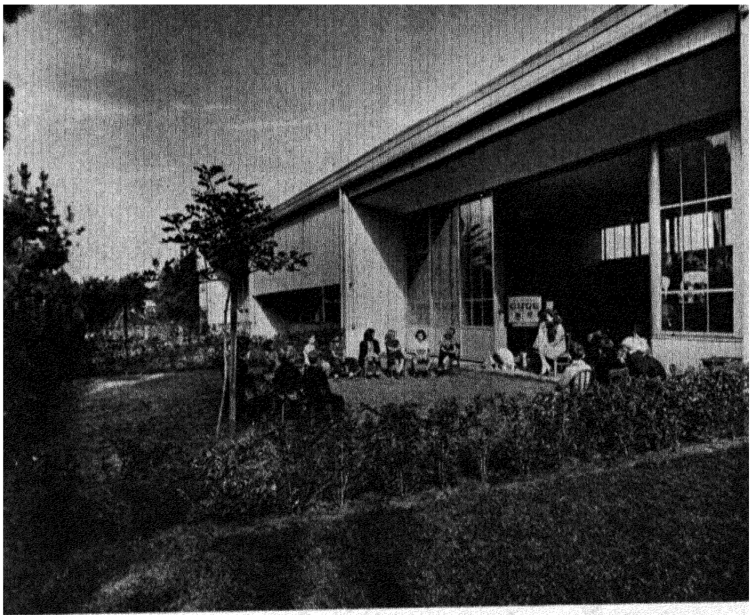
So, as far as basic orientation is concerned, in bare outline you have a case for north, south, east and west, each of which is right. Obviously, of itself no one of them can be judged except in its own setting. In the Lower Rio Grande valley, prevailing wind and the ability to feel the motion of air on a student's body outrank the handling of the light itself in importance, and have an effect on orientation. What has been said is not a plea for being unprincipled and having no convictions on orientation, but rather to suggest that unusually deep study will be rewarded in learning the conditions of the particular site with respect to the particular building that is being contemplated.

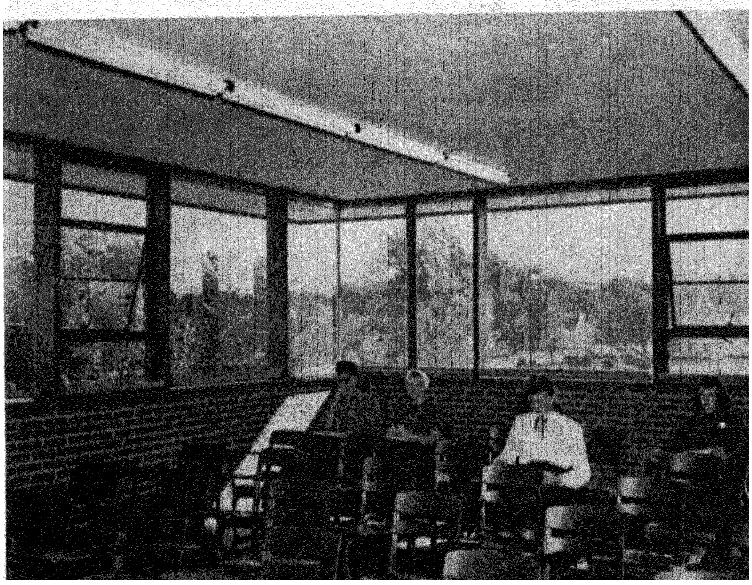
Climate is involved. The authors once had occasion to study a building in a particular cloud belt in a particular part of the country, where the natural daylight was of such brief duration and of such limited quantity that it was recommended that the natural lighting be

Trees reduce sky-glare all year 'round. Courtesy of American Structural Products Co. Toledo, Ohio.



Movable vertical awnings, like jumbo window shades, control sunlight at the Corona School, Bell, Cal. Note clerestory affording bilateral lighting to classrooms, and sliding window-wall, which makes possible extension of classroom to out-of-doors. Richard J. Neutra architect. Julius Shulman photo.





Thanks to modern technology, windows can turn corners. Good bilateral lighting (note bottom-up window shades). Courtesy of Ganster & Hennighausen architects. Snazelle photo.

subordinated until it became mainly a psychological factor. In short, the windows were there to look out of and did not help much to light the room. Principal dependence was placed on artificial lighting. This is a fifth compass point to add to the four that have already been mentioned—no direction at all. Orientation can safely be ignored in such a case.

Climate is by no means the only factor. There is the subject of microclimatology, mentioned elsewhere. It is said that the California Japanese truck gardeners used to get their vegetables to market days ahead of their competitors by planting them on the south side of the overturned furrow rather than at the top. A building is somewhat heavier in scale than a strawberry plant, but rewards the same kind of perceptiveness. This is merely to suggest that taking advantage of slopes, planting, moisture and character of the soil itself is part of the design of a building in the utilitarian as well as the esthetic sense.

It must be obvious that the branches of a tree shading a window make a different lighting problem than if the tree were not there. A treeless prairie introduces the problem of sky glare whereas reasonably tall trees 100 feet or more away may have a distinct bearing on the need for venetian blinds and other glare reducing devices, and consequently on the orientation of the building itself. Immediate surrounding play areas, pavement, grass are important. As an example, foliage can mitigate or make actually desirable a compass point of orientation which would be unusable under a generalized set of rules for a particular climate.

Innumerable devices for directing and controlling natural light have made their appearance. They run the gamut from roller shades and draw curtains to the most elaborate kind of Rube Goldberg carpentry. Projecting units outside the building with what amounts to an outdoor venetian blind have made their appearance in every part of the country. Venetian blinds inside the window, cloth baffles at various levels on the window, sloped ceilings, light colored sills, outdoor reflectors and a host of others have been tried. And probably all of them have done some good. One that Perkins and Will have tried is an outrigger with vertical slats, which has the effect of breaking up the sun pattern in the upper part of the window during the hours when the sun is beating against that wall; and then when the sun is on the other side of the building, it lights the white painted surface of these outrigger boards and is, in

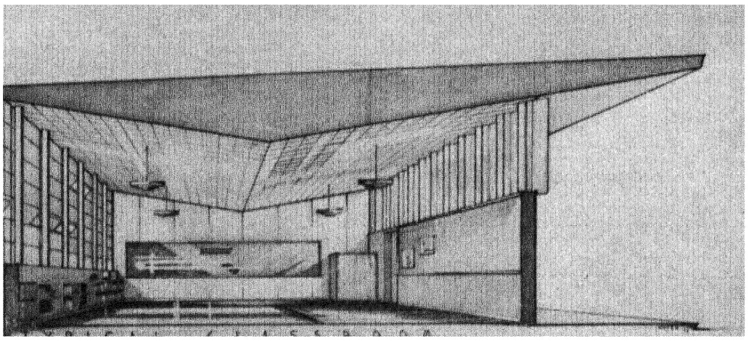
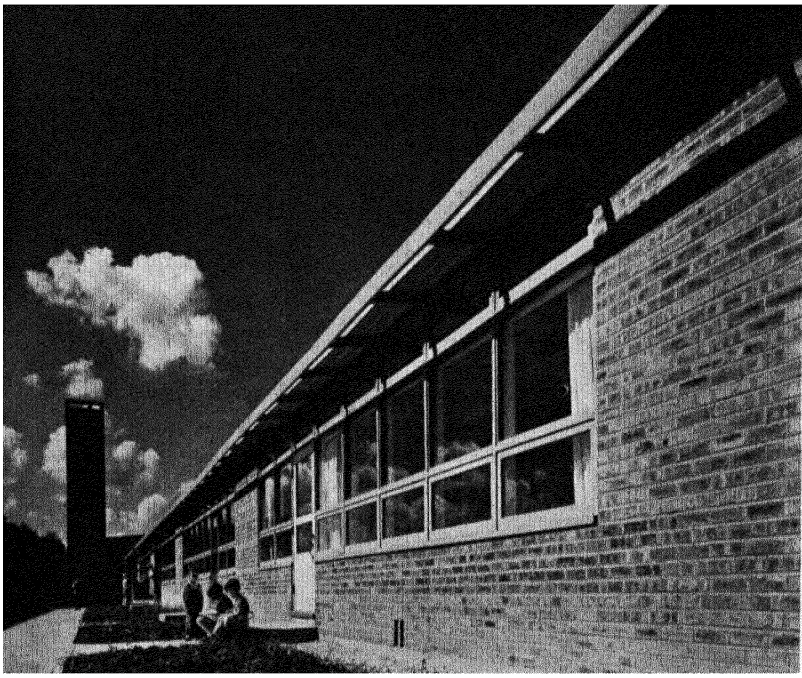
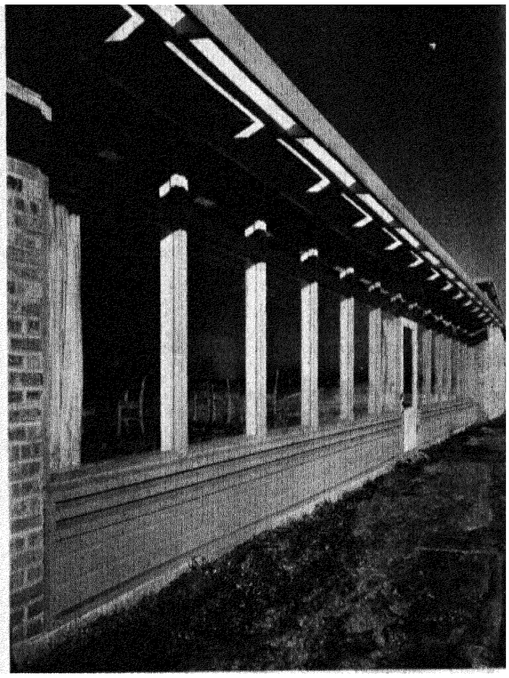
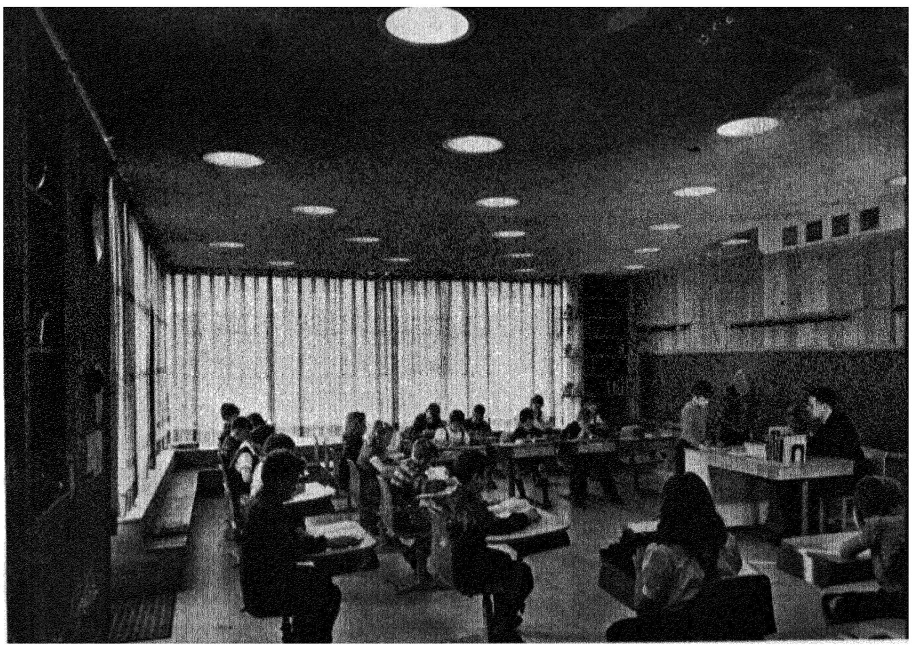


Diagram section of typical classroom, Visalia High School, Visalia, Cal. Noteworthy for dihedral ceiling, extensive roof overhang, bilateral lighting. H. L. Gogerty architect.

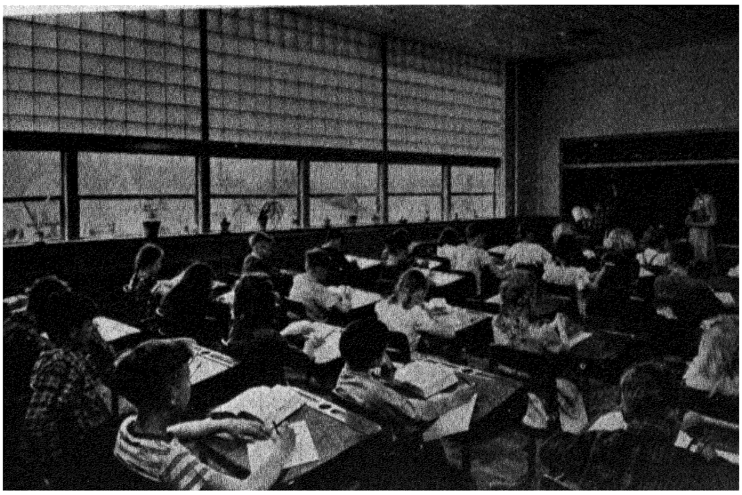
Outrigger extending from roof is in effect a light fixture—breaks up sunlight pattern during part of the day, catches and reflects needed sunlight at other times. Rugen School, Glenview, Ill. Perkins & Will architects. Hedrich-Blessing photo.





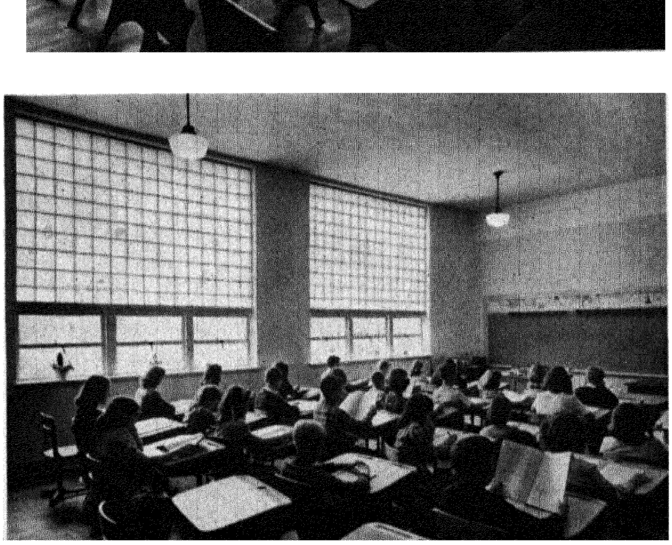


Draw curtains control light, absorb some sound, and are decorative—and require laundry and replacement. Crow Island School, Winnetka, Ill. Perkins, Wheeler & Will architects. Hedrich-Blessing photo.



Glass block brings in light, clear glass brings in the view. Of course, more glass would bring in more view.

Directional glass block directs light toward the ceiling and across the room. Nathan Hale School, Toledo, Ohio.



effect, a continuous light fixture lighting the side of the room away from the sun.

(Since confession is probably good for the soul, it must be admitted that this particular outrigger found its way onto this design to cover up the wartime lack of sheet metal, and its usefulness as a supplement to the lighting of the room was a happy accident.)

As far as control of natural light is concerned, there is probably no perfect answer. Certainly no answer will apply indiscriminately to all climates or all parts of the country. Roller shades wear out and have other faults. Every well brought up housekeeper that ever turned schoolteacher draws the curtains in her room neatly over the upper half of the window, thus destroying its usefulness as a light source and sending the electric light bill rocketing on the nicest days. The brighter the day, the more surely the curtains will be drawn. Draw curtains have the advantage of providing both decorative and utilitarian value at one stroke, and depending on the material, can be used either to diffuse or exclude the light with great success; but have the disadvantage of requiring cleaning, of rotting in the sun, and requiring replacement which is never convenient at the time it is required.

Glass fiber fabric gives great promise in this use when it becomes economically available. The almost unlimited field of plastics may bring other needed answers.

Venetian blinds are highly successful while they are clean, but they are an adjustable piece of equipment, and as such, they can go out of order. They require maintenance and adjustment and cleaning. In a climate where cleaning is no problem, one decision may apply; in a smoky, grimy city where windows are left open part of the time, quite another answer may apply to the identical blind which was appropriate somewhere else.

An indispensable part of the consideration of light control is the decoration and color of the room which is being lighted. This will be taken up in greater detail elsewhere, but it is not an entirely separate consideration.

Of rising popularity is directional glass block—a prismatic affair which takes light from any angle and twists it so that it is directed upward after it has passed through the correctly placed block. Its application should be in areas above the eye level so that the bent beam of light will not glare in the eye. This material has the added advantage of being a heat insulator, and of taking light and directing it to the opposite side of the room where it presumably is needed. In climates where the sunlight is not steady or

reliable, it has the disadvantage of actually filtering out large quantities of light and leaving a grayer, darker room on gray, dark days. Such a condition may not apply to the California desert, but certainly does apply to the river bottom near Pittsburgh. This remarkable and promising material, like all others, becomes less than perfect when it is not cleaned regularly and frequently.

A device which expands the possible uses of this material is to place the block above the 6-foot line in the normal position so that the light is directed upward as it passes through them. Below this line turn them upside down so that the light will be directed against the floor rather into the eyes of the people using the room.

Artificial Lighting

The conditions of the problem, as outlined earlier, are more simply met—except for costs—by artificial lighting than by natural lighting. Natural lighting comes in quantities and directions that vary from minute to minute. Artificial lighting has the quality of predictability and availability. You can have abundant, directionless, satisfactory light by throwing a switch, provided the client can pay for it. But the premises from which this chapter is started suggest that it is important, and a good lighting job is undoubtedly worth more than some impressive exterior architecture.

The factors from which a good system of artificial lighting may be designed have been exhaustively treated and are best summarized in the proceedings of the Illuminating Engineering Society's Committee on School Lighting. Endless debates have been engaged upon to determine the relative merits of direct versus indirect, fluorescent versus incandescent, artificial versus daylight, and so on. To take them in reverse order, artificial is not versus daylight. It is supplementary to and co-partner with daylight in doing a job. After daylight hours the partnership gets one-sided.

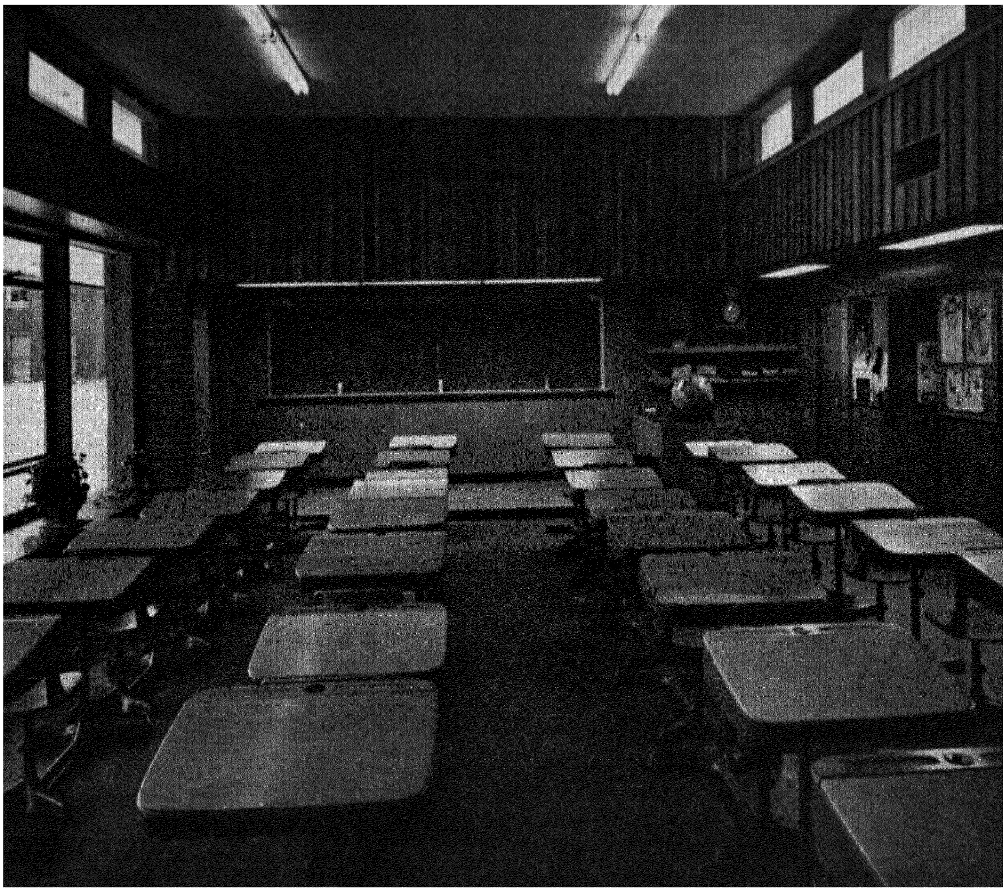
The most efficient lighting system, as far as delivering light to a given surface is concerned, is exposed direct lighting with no fixture or shielding whatever. In terms of delivered light versus power output, this is tops. But efficiency of output obviously is not the way to measure lighting. Because such direct lighting is probably the worst imaginable way to light a room. Good seeing requires low brightness ratios, and direct lighting assaults the eyes with the highest possible brightness ratio . . . an intense spot within the visual field. Hence shielding and hence fixtures. The purpose of a fixture is to deliver light to the working surface in comfortable form, and this can now be divided between the modified direct and indirect methods.

The case for indirect light is one of completely diffused directionless light pervading every corner of the room. The ceiling or upper parts of the room are made luminous by pounding light against them from a fixture directed away from the working plane. The quality of light which reaches that desk may be excellent, but it is rarely a completely successful way to light, even so. The inefficiency of using a reflecting surface which gets dirtier with each passing week is obvious. Less obvious is the fact that the eye of a person entering an indirectly lighted room adjusts to the luminous ceiling surface as the general level, and then brings his contracted irises to bear on a surface which must seem dim by comparison.

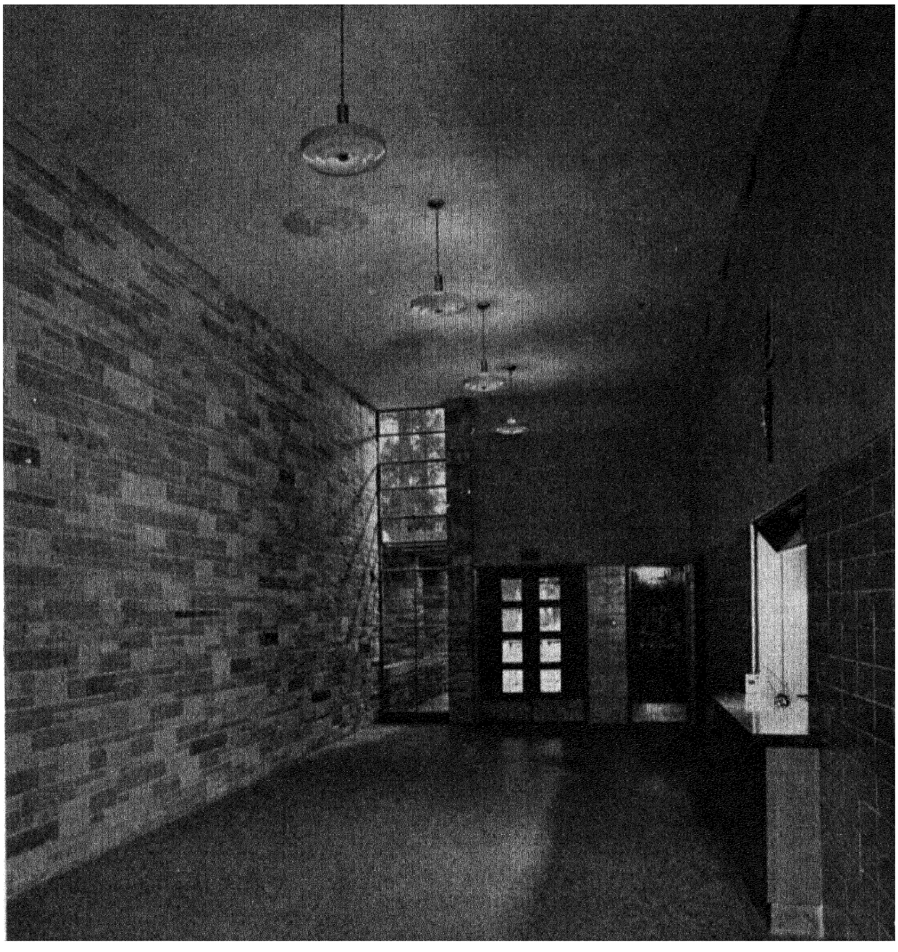
Direct lighting, on the contrary, with its greater efficiency, poses the very difficult problem of shielding. This can be done by fixtures with concentric rings or those which send part of the light up and part down, or other compromise devices.

Remembering that the light which you wish to use is to come with even intensity and leave the working plane the brightest and most cheerfully lighted part of the room, the fixtures which minimize the contrast and busyness of light and dark on a ceiling and still pump the light directly down are the most nearly successful from this regard. The extension of this idea is the increasingly popular louverall ceiling, which is, as of 1949, the last word in direct light from a concealed source. The ceiling appears to be less light than the surface it is intended to illuminate. This system, too, has its imperfections. One is cost, which is substantial. Another is difficulty of cleaning a rather complex form periodically. An answer to this factor has appeared in the form of expendable coated paper louvers which are replaced when dirty. In a dry, smokeless climate, this may not be needed. The difficulty of the cleaning job is probably less than that of cleaning a venetian blind, but closely comparable. The louverall ceiling comes into its own when it is used in conjunction with the lower ceiling height and the greater depth and shorter corridors that result when it is exploited in a building to its logical conclusion.

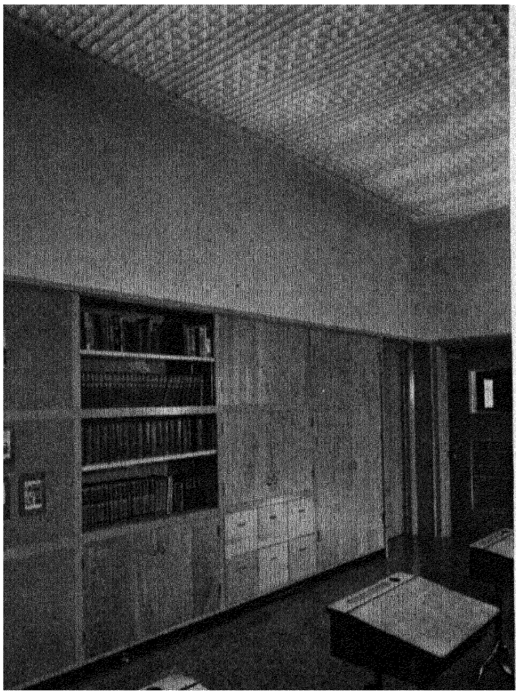
The case between fluorescent and incandescent luminares gets down to a question of heat. Anything up to 25 foot-candles will

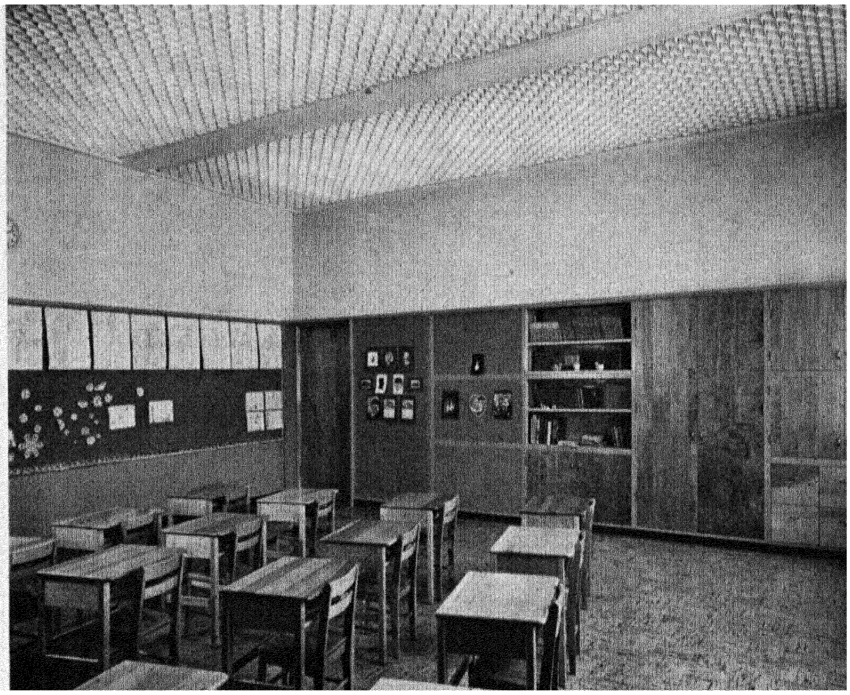


Fluorescent lighting used to high spot blackboard and corkboard areas. Also an excellent example of double clerestory daylighting Ganster & Hennighausen architects.



Incandescent light is distributed well by silvered bulb and concentric rings. Main entrance, interior view, St. Theresa of Little Flower, Houston, Tex. University of Houston photo.



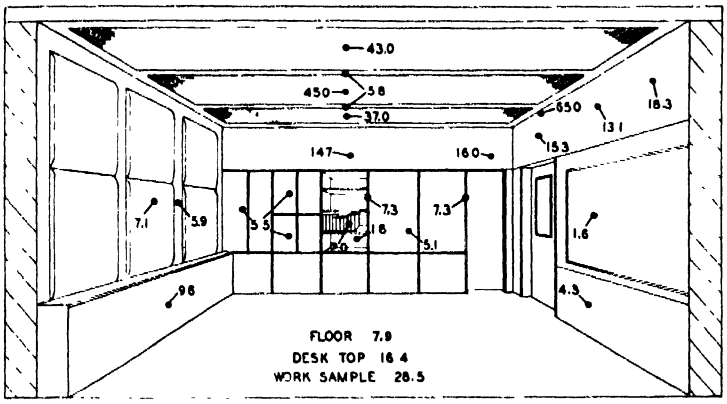


probably not overheat a room, in either fluorescent or incandescent, except in already very hot climates; but as intensities mount and consideration is given to such levels as 50, 60 or 100 foot-candles, the additional heating load by incandescent means gives an advantage to fluorescent sources. Conversely, the incandescent source has the advantages of usability and simplicity of installation when the job to be done is simple and requires modest intensities.

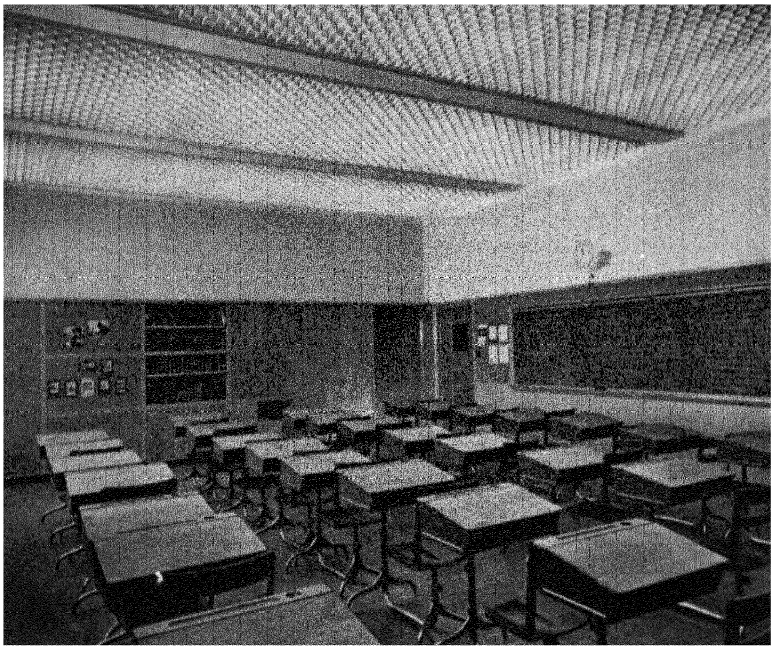
Experiments have been conducted comparing the louverall or "egg crate" ceiling with a luminous ceiling, which has a plastic or glass membrane to distribute the light evenly over the whole room. The case for the luminous ceiling is the reduction of specular reflection, or glary spots on slick paper reflecting the lamps in the ceiling, versus the more evenly diffused light which reaches the book from the luminous ceiling. These experiments conclude that the luminous ceiling delivers a preferable quality of light to the printed page, and that the "egg crate" ceiling is "the surest way to waste money."

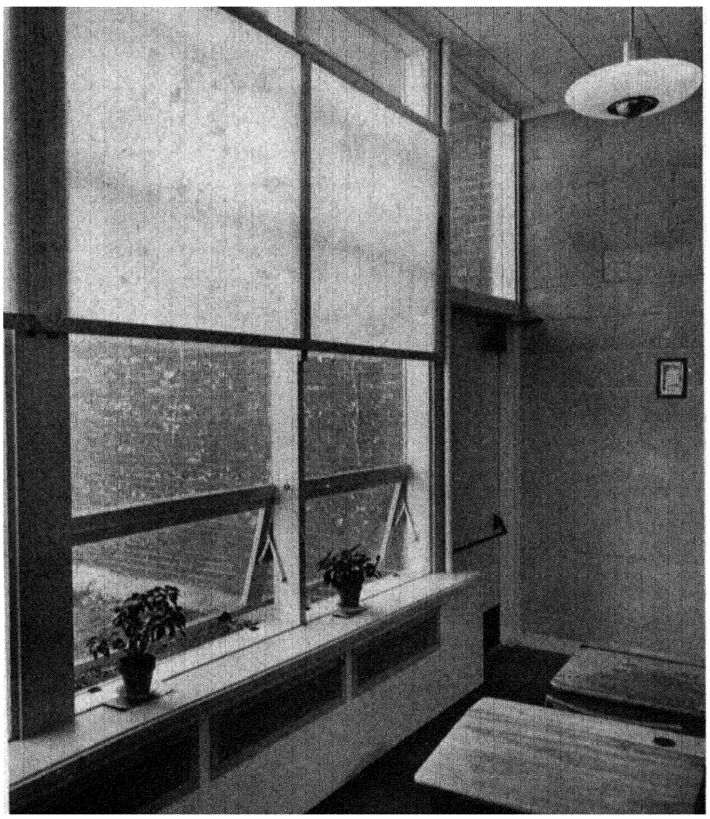
Perkins and Will have evidence to the contrary. They have examples of each type in their office and have built examples of each. Faults ascribed to the egg crate ceiling need not happen if the total design is competently handled, and they are in a position to warn that a continuous luminous ceiling of glass, plastic, or fabric will present an intolerable maintenance problem on a year after year basis.

Embraced in the foregoing is the admonition that lighting must not be allowed to get out of balance with its surroundings. The less prominent, the less sharply contrasting, the more balanced in brightness the light source can be, the most nearly it is achieving one of the qualities of good lighting. Balanced brightness is, of course, integrated into the scheme of decoration where colors are considered for their reflectivity as well as their esthetic stimulus; where floors, work tops, chairs, walls and woodwork are all blended into relatively unviolent contrasts and have a dull blond finish. One of the great contributions to improving lighting in an old school can be to take the old stained woodwork which looks nearly black against the calcimine wall next to it, and paint it to a color more nearly matching its surroundings. The present design trend in all phases of architecture toward blond woodwork is no mere stylistic expression. It is a genuinely preferable, visual comfort element.



Louverall "egg crate" ceiling at Lincoln School, Park Ridge, Ill. Perkins & Will architects. Hedrich-Blessing photo.





Light finishes on inside surfaces reduce brightness contrasts, make better seeing. H. G. Crawshaw photo.

Heating

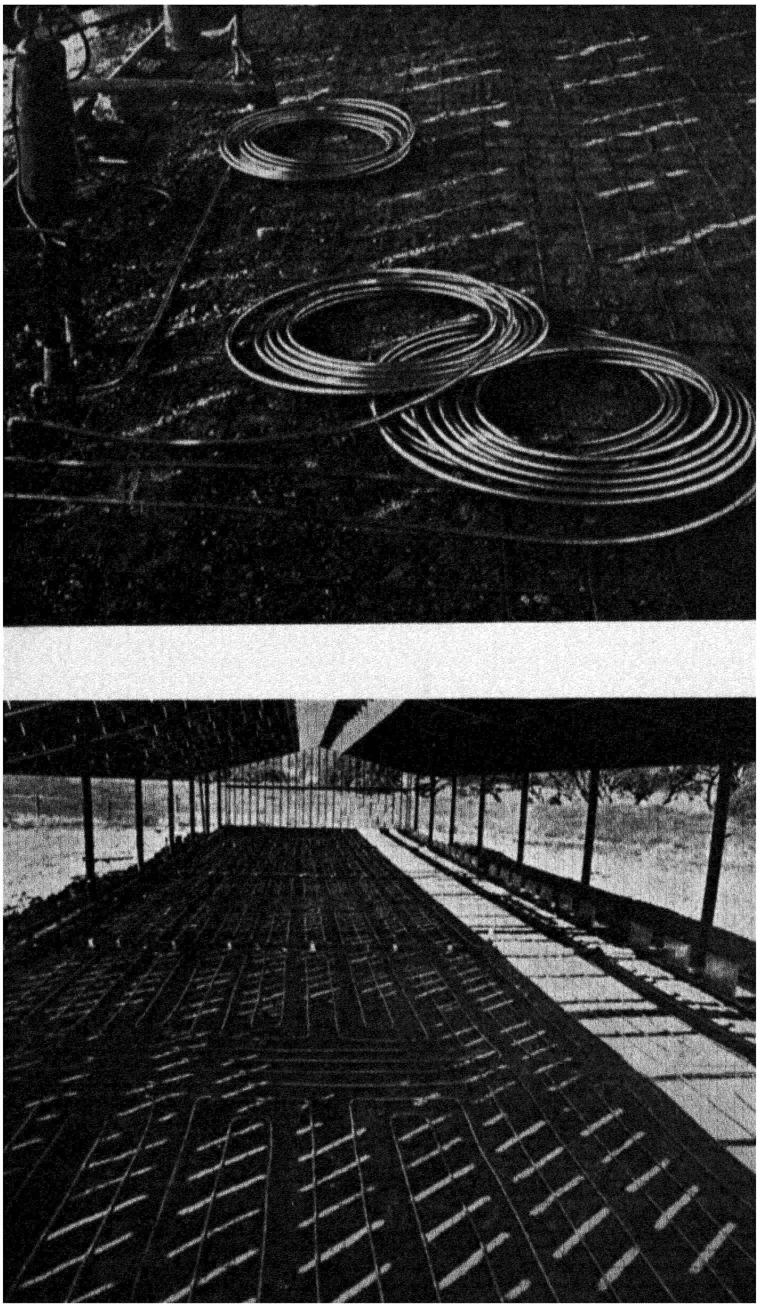
No American man is so abject that he does not have an opinion on heating. The pursuit of the illusive B.T.U. and the gadgets for making it go where and when it is wanted, have been the subject of endless tinkering. There probably is no right and complete answer on heating to put into a book which will have readers who are widely separated geographically. At a recent conference in Texas, the Texas architects could not even agree on what was the climate of West Texas and whether or not certain heating assumptions on a student competition were valid. The United States is even bigger and poses more varied problems than Texas itself.

As an example of local factors, it is safe to assume that no Texas school that can have natural gas for the asking will heat its building with Pennsylvania coal. The factors which govern this decision go far beyond mere choice of fuel. Gas, oil, and coal, and we presume uranium soon, are only part of the problem. After you have generated the heat you have to send it somewhere, and you will send it by air, by water, by steam, or by wire. Or you will pump it out of the ground by reverse cycle methods.

The most this book will attempt to suggest in the field of heating is an attitude. Comfort and health is the primary end product, and the extent that heating can contribute to them will have some bearing on the choice of system. Economy, of itself, will not begin to give a safe measure since, like lighting, hot spots of great heat intensity may be most efficient in a dollar sense, but they do not achieve comfort and are therefore unusually wasteful.

Perkins and Will have had occasion to employ the principle of radiant heat, achieved in one instance by putting warm water coils under the floor. They are convinced that this system, which is particularly good for lower grade rooms because it achieves a warm surface on which the children may play, is subject to very severe limitations centering around the idea of flexibility and response. In a zone where the temperature range is from 70 to minus 10 degrees they are carrying two-thirds to three-quarters of the heating load by warming the floor and supplementing it by wall radiation geared to individual room thermostats to secure the advantages of quick response to the need for more or less heat.

The liability in the case of radiant heat is illustrated by a situation where, on a cold, cloudy winter morning, the building is ready to receive its students and is 70 degrees warm at the time school opens. There is snow



When the copper tubing has been connected, wired to the steel matting in a definite pattern, tested, and embedded in a concrete slab, water will circulate at a controllable temperature to make radiant floor heating. Courtesy *The American School and University*.

on the ground, and the wind is rising. By 10 o'clock the wind blows the clouds apart, and the sun shines down on the snow. Light and warmth pour into the building. It is very difficult to slow the heating system down quickly enough under these conditions when only radiant heat is used, since the mass of the floor just will not cool that quickly.

They have also had occasion to use direct wall radiation as the only means of heating. They have used unit ventilators where air changes as well as heat in-put were requirements. They have had outstanding engineering opinion to convince them that radiant heat installed in the ceiling above the "egg crate," which also shields the lighting system, is practical and desirable—probably a better installation of radiant heat than that under the floor, in many conditions.

And incidentally, they know of several installations where forced warm air from a separate furnace for every two classrooms—the so-called "winter air conditioning" of speculative house building fame—has been a highly practical installation when a modest initial building was expected to be expanded from time to time and the first stage was not to bear the extraordinary cost of a central heating plant.

An all important factor in design is the equated cost of labor. Under a particular set of conditions automatic handling of fuel versus hand firing will account for a labor saving of a measurable number of dollars. The cost of the equipment or the cost of the more expensive fuel, or both, will be higher and will have to be amortized at a measurable rate.

It is sometimes more profitable to waste labor and put on additional men for this service, but this is an increasingly rare result of these computations. Janitors' wages keep going higher. Custodians do not get wages—they get salaries—for constantly growing requirements of training and competence. The entire school plant is an increasingly complex organism, and such men should be freed for their best efficiency if automatic equipment only breaks even in operating cost. If, in a particular instance, a change from coal to oil were to add $500 to the fuel cost of running a particular building and to reduce the total maintenance by $1200, the decision would not be difficult to make.

This a la carte bill of fare may suggest that the authors are without conviction in the matter of heating, which is not quite the case. At the expense of being repetitious, we would remind the reader that this is a big country. Every situation varies in place, and, equally important, in time. The market for one method and its availability may be one thing one year and another thing another. The most we can counsel is to keep an open mind and employ a good engineer.

Ventilation

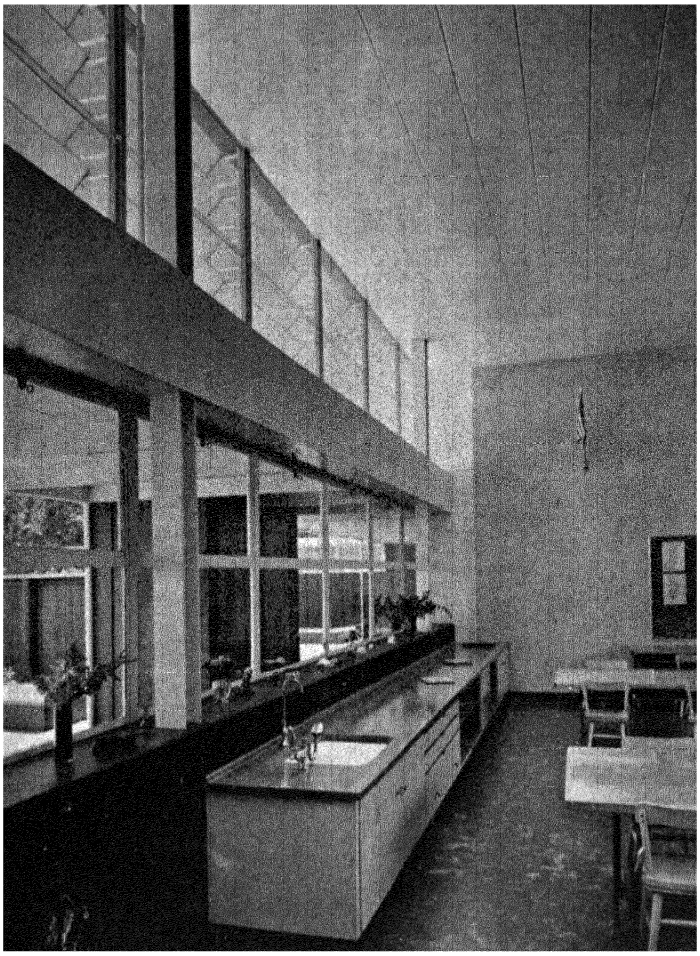
Like lighting, ventilation has developed a great deal of very exact science around some empirical and frequently inaccurate hypotheses. An earlier generation asserted that every room should be subject to six air changes per hour. This was in the day when carbon dioxide had had a very recent public relations treatment, and everybody was out to combat that poisonous stuff. Another way of saying the same thing was that each occupant should receive 30 cubic feet of air per minute. It should have been obvious that a Paavo Nurmi at the end of a 5-mile race could not be sufficiently winded to pass this much air through his lungs, but each of these standards has found its way into law in various states.

Another justification for a high level of ventilation, quantitatively speaking, has to do with odors. Odors of wet clothing and less than freshly bathed bodies would be offset by not using the same air twice, if you could help it. Of course, this ran into trouble. Hundreds of times the drama has been enacted where engineers and custodians have submitted their building to the inspection of the state authorities.

Anemometers, smoke bombs and blue-eyed persuasiveness were employed to show these representatives of the public good that the system really was changing the air that often. Upon their departure, the custodian, acting on no other orders than a broad wink from the superintendent of schools and the president of the board, made the rounds of his controls and throttled the system back down to a temperate two and one-half or three air changes and proceeded to run on that basis from then on. It was designed for six and operated at three or less, because they did not feel they needed the air changes and because the effect on the fuel bill was painful.

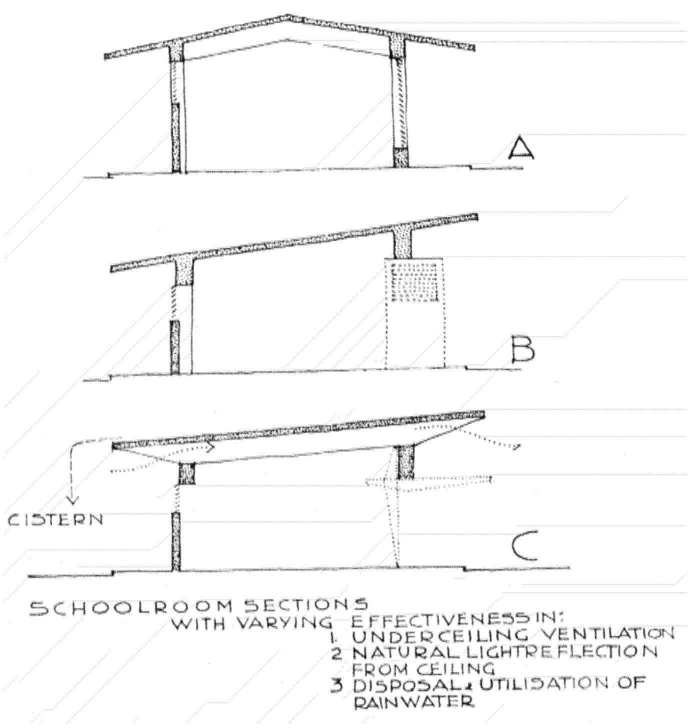
Comfort is about as difficult to define as good seeing conditions, and it varies enormously with the degree to which the student is interested in the work he is doing. However, it is unarguable that the end product should be within ranges where the body can keep functioning at its normal rate of evaporation and energy expenditure and not force either drowsiness or excessive energy consumption on the occupant of a room.

The ventilation required under extreme



Light and air are led across the classroom through ceiling-high louvers School in Fairfax, Cal Bamberger & Reid architects Roger Sturtevant photo

Urban Schools for Puerto Rico Richard J Neutra architect



conditions that happen on the Gulf Coast on a hot humid day are obviously a local problem. There, ventilation is so important that it outweighs many of the other factors which influence orientation and placing of the building with relation to its site and view. The ability to move air in discernible quantities over the body of each occupant so that he can feel a breeze is an element of design, and anything which tends to deflect or impede the flow of air must be minimized if work is to be done under those conditions.

For the greater part of the country the more temperate situation can be handled by a range of devices—at one end of the scale by opening a window—at the other by complete forced ventilation under completely mechanical and controlled conditions. The authors do not recommend placing complete dependence on the mechanical end of these alternatives. Machinery breaks down for one thing, and the smell of damp spring earth may not be scientifically defensible, but it's nice.

There is a huge factor for illusion in this whole business of ventilation. We have been told by a most matter-of-fact heating engineer that he once cured a faulty ventilation system in an entire building at the expense of 5 cents a room. He bought a small piece of ribbon and tied it on the air intake grille so that it would wave and stand out nearly straight under a comparatively light movement of air. A ventilation system which "hadn't worked" up to that time, from then on "worked perfectly" by all reports.

Professor C. A. E. Winslow of Yale has written extensively and ably in defense of window ventilation. He suggests that the law of gravity and the breezes that blow both cost very little to operate, and that between the two of them, the air in any well designed room can be changed often enough for purposes of health and comfort. We are making no attempt to present Professor Winslow's full thesis and viewpoint since his writing does that very much better, but he feels that the importance of the minor perfections achieved by mechanical ventilation has been very much exaggerated.

If window ventilation is to be used, the authors suggest separating the function of letting air in from the function of letting light in, and doing it through two different openings. In the Rugen School, for instance, and in others, a row of louvers below the window sill has been introduced to let in air and still protect from light leaking and rain driving in, a hazard common to open windows. There are several advantages

to this. The screening can be placed permanently and in the moderate amounts that will permit this insect barrier to be paid for and maintained without touching it for decades at a time. It also permits the curtains, preferably draw curtains, on the window above to be drawn completely for the purpose of darkening the room without losing the benefits of the open window and fresh air while it is so darkened. This also enhances the value of the double glass material which has become available in the last few years. Large units of heat-insulated glass wall can be achieved in fixed units rather than the expensive operating sash, and you get continuous possession of storm sash, an easily cleaned unit, screens permanently in place, and ventilation when the room is dark.

Mechanical ventilation is not and never has been any particular mystery. The judgment underlying how much to use (or do without) was and is debatable, but the only thing required to get an agreed result is money and the obedience to a few simple laws. A generation ago a central fan and a branching system of duct work with preheated air pumped considerable distances to outlying rooms, was a very popular method for heating and ventilating schools. Many of these installations were mechanically successful. Few were financially so, since they drew a large percentage, if not the entire amount, of air from the outside. Inadequate provision was made for recirculating the air heated at such great expense. A trip through many school buildings built during the twenties will show elaborate systems standing idle winter after winter, and dependence placed on room radiation and window ventilation.

A major argument used against them, not as compelling perhaps as cost but still an argument, is that such systems are wonderful transfer agents for the germs of one area to the victims of another. To meet these objections in areas where mechanical ventilation is required, the very popular unit ventilator has been developed, which, in effect, sets up a local ventilating system for each room. This device is not only a major element in the heating system, but it takes some air from outdoors and recirculates some from each room, depending on the temperature of the outside air and the amount of heat required by the room. Several of the objections to the central ventilating systems are met, while an alternate objection is raised. The least amount of fresh air is being introduced from the heating load when the dependence on staying indoors is greatest. In other words when the students have to stay indoors and the building is already sealed up tight for comfort's sake, the air that goes through the unit ventilator is for the most part recirculated inside air, whereas in the nice temperate winter days when the windows might be opened anyway, the unit ventilator then takes in formidable percentages of outside air. (The objection that unit ventilators are noisy has been recognized by the manufacturers and is being corrected.)

Air conditioning is one of the more loosely used bits of terminology. Most schools do not run in the summer. The air conditioning load, therefore, is minor.

Air conditioning can mean anything from running air through a dust filter to cooling and dehumidification. Need varies with latitude; type varies with geography.

A popular form of air conditioning in southwest desert country is an evaporator machine such as those stuck on the front of trucks.

The expense of full air conditioning and its psychological problems probably limit its future in school plants.

Acoustics

Today's school requires acoustical treatment much more than the formalized school of a few generations ago. Then you *had* to keep quiet. Disturbances consisted of the scratch of a thumbnail on the blackboard, the scraping of restless feet on the wood floor of a classroom, the thunder of students passing "quietly" from room to room, the banging of desk tops (just softly enough to escape a reprimand)—all of it intensified by the hard plaster walls, the hard glass windows, the smooth wood floors, and the smooth ceilings, tossing each sound back and forth for a round half dozen return engagements.

And if you think that was bad, add today's requirements. Today you hammer, you nail, you saw, you committee-meet, you build, you draw, you go from place to place within the room and within the building. Chairs and tables are pushed into formations to provide for committee meetings and pulled apart again to clear the floor for a whole gamut of activities. Binding a book may not make much noise, but talking about it and planning to do it does, and it usually needs to be done in a room where other people are doing other things. Building a hogan or a grocery store or setting up the room to read "Taming of the Shrew" all add to the general noisiness. Sound movies, radio and television complicate matters still more and give added emphasis

to the need for sound-controlled school buildings.

The noisy, disturbing elements that have always existed still exist in a louder and more intensive form, and what could once be corrected by formal discipline must now call acoustical science to its aid or fail. Reduction of noise is a justifiable objective. It is far more important to provide for good hearing at all times and in all parts of the plant.

Any parallel surfaces, such as a smooth floor and a smooth ceiling, or hard walls opposite each other, can set up a condition of reverberation which bounces each sound back and forth to din against the ear several times, when once would do. The six surfaces of a normal classroom provide three such pairs, so placed and at such distances apart that the echoes are just below discernible frequencies. The normal ear isn't quick enough to distinguish the separate echoes as the sound travels back and forth between these surfaces, but it is getting the benefit of these repeated assaults nevertheless. As the rooms get larger and larger—for instance a gymnasium, rectangular in plan and with smooth floor and ceiling—the separate impulses and the long duration make each sound painful and confusing.

Corridors, with their hard walls, floor and ceiling, send every sound ricocheting down their length. Normal voices rise, echoes even tempt. Tread of feet mingles with door closings. Healthy, active, classroom noises funnel out, pile up confusion. Order, sounding like disorder, tends to become disorderly.

So what? Why do anything about it? You can't prove that it's valuable for a teacher to be calmly in possession of herself at the end of a day, but it is. You can't prove that certain conditions contribute to a pupil's concentration and ability to learn, but they do. You can't prove that a corridor that doesn't respond like a rain barrel to the youngsters' shouts contributes toward calm and discipline in the corridor and the classroom, but it does. You can't prove in any of the rooms where some people speak and others listen that things that contribute to the comfort and efficiency of that relationship have value, but they have.

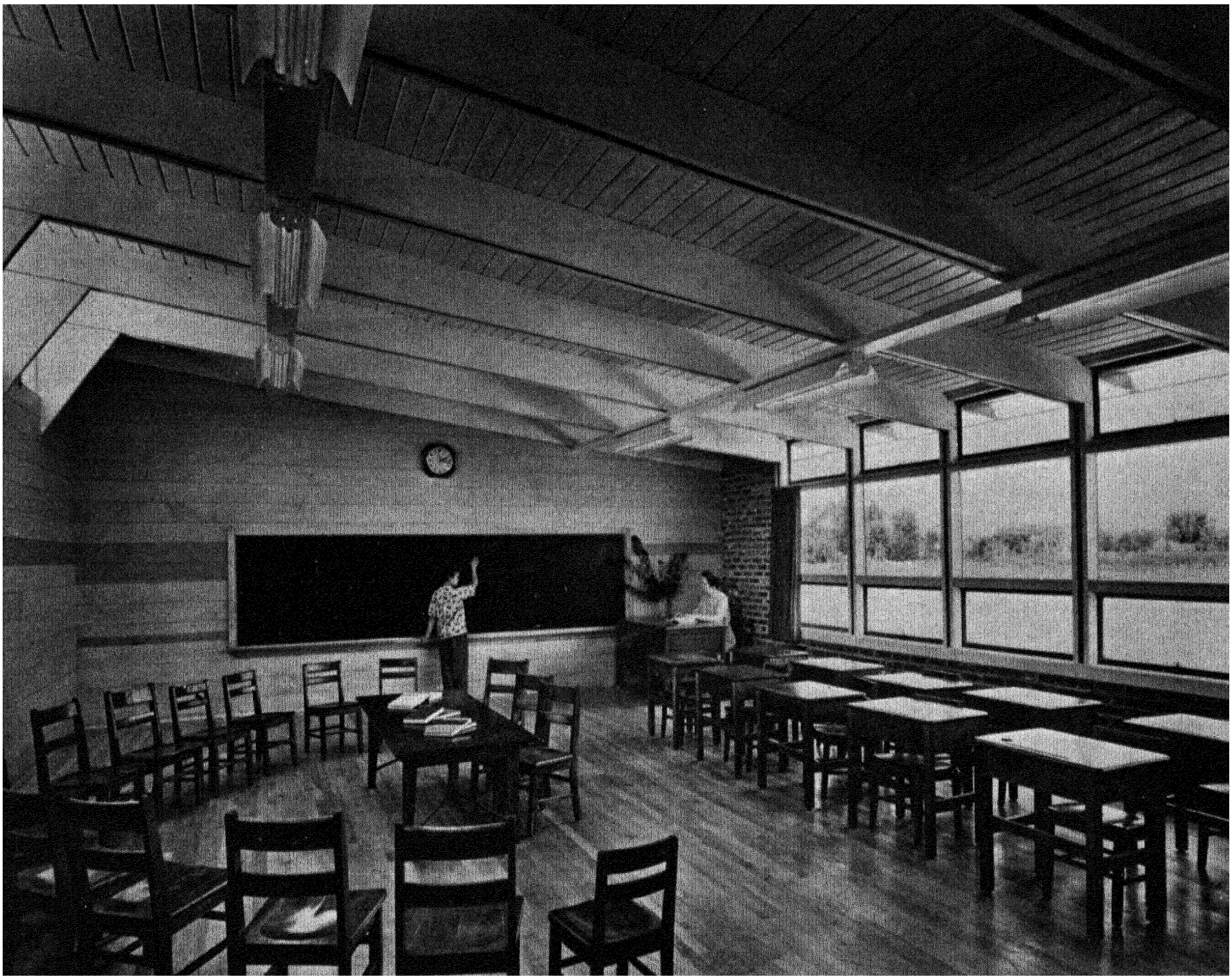
There is some proof in other fields where the value of services can be measured and where the accuracy of performance can be evaluated. The Johns-Manville Company has made studies of telephone switchboard operations and business machine operations before and after acoustical correction. They obtained statistical proof of astonishing reductions in the number of errors per day and per week. Embraced in these figures is the thought that communication was more effective and nerves more under control under the corrected conditions.

To get back to our parallel surfaces, what are some of the things that can be done to mitigate their disturbing proclivities? In the first place, they do not have to be parallel. Many and many a classroom has a sloping ceiling, usually done primarily to secure lighting advantages, but with a sharp acoustical dividend, because the sound does not get nearly so many chances to bounce back and forth over its own path. The sloped ceiling in itself is probably not enough, but it helps.

That same sloped ceiling, or a level ceiling for that matter, is a very logical place for the application of acoustically corrective fibrous material with holes drilled in it at regular intervals. It is well known that the purpose of those holes is to take the energy from the wave front of the sound and absorb some of it and return some of it to the air in a mixed up pattern which will return an irregular, confused and diminished wave front back as the echo from that wall.

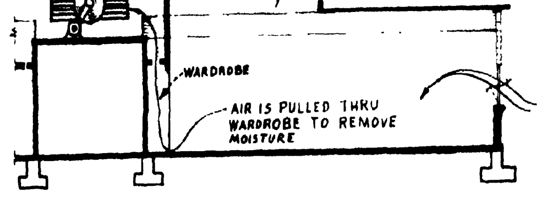
A device which may become popular and is certainly effective is a treatment of one of the side or end walls of a room with a surface of cement asbestos drilled for deadening treatment and set away from the wall on strips with an insulation blanket behind it. And it has the added virtue of providing a beautiful surface which is adaptable as a continuous bulletin board from wall to wall and floor to ceiling in a material which can be readily cleaned. To convert this into a bulletin board it is only necessary to buy 50 cents worth of golf tees, which just about fit into the holes in the normal stock material of this sort.

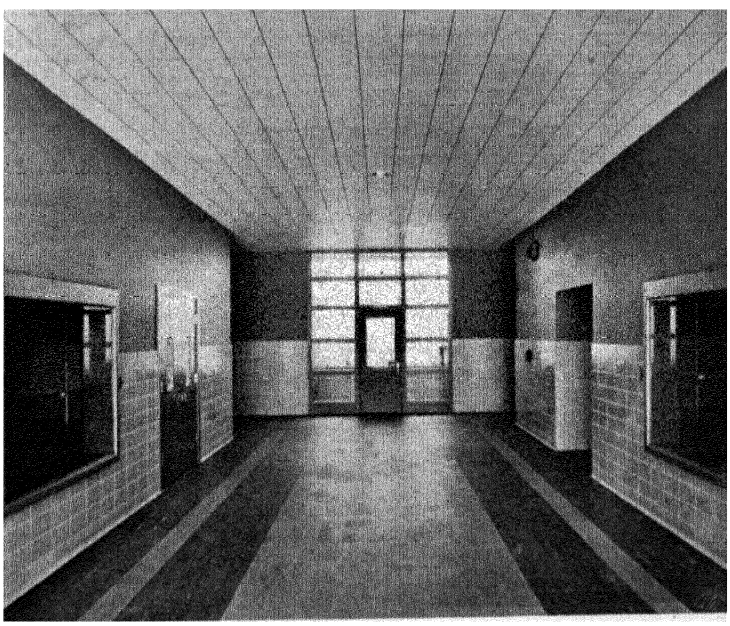
There are several good acoustical plasters whose common property is porosity, the object being to provide a poor reflectivity surface for such sound as strikes against it. The application of this material is well understood. Its strength is its simple homogeneous appearance, similar to large surfaces of sand finished plaster where a pattern is not desired. Its liability is that it is susceptible, like any other plaster, to cracking and is very difficult to clean well. Each time such a material is painted, the tiny holes tend to get filled up, and its ability to absorb sound energy becomes correspondingly lessened. A vacuum cleaner with brush attachment postpones the day of painting—in some particularly clean parts of the world perhaps



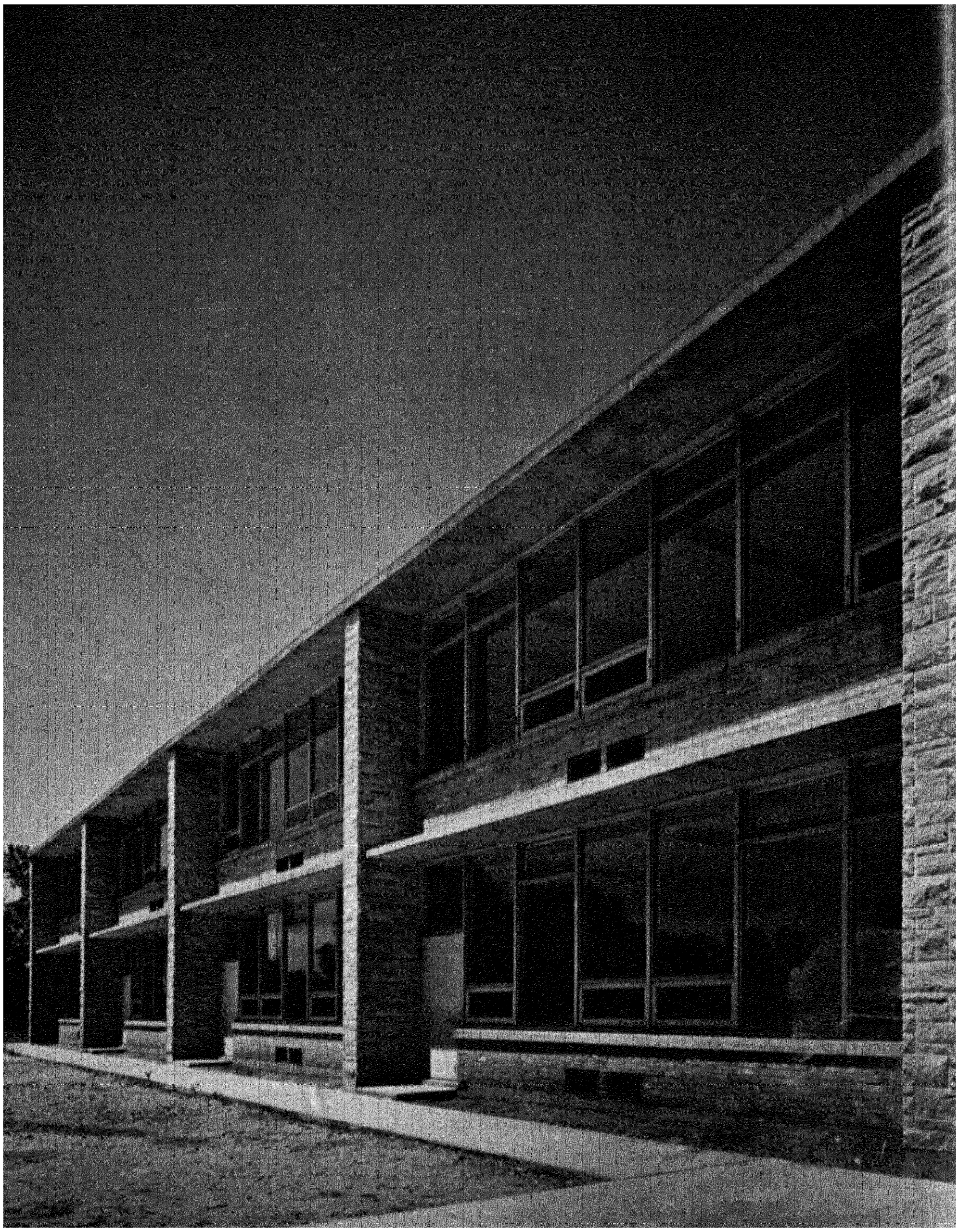
Without standard acoustical treatment, this classroom is relatively quiet because slanting ceiling, exposed beams cut up sound patterns. Perkins & Will architects. Hedrich-Blessing photo.

Exhausting air through the exterior walls at corridor ends eliminates the troublesome roof vents. Edmonds Schools, Edmonds, Wash. William Arild Johnson & Associates architects. Courtesy *The American School and University*.





Perforations in ceiling-tile break up sound waves and make quieter corridors.



"Jibs" help to screen sounds from neighboring classrooms when windows are open —and shade windows, too! Perkins & Will architects. Hedrich-Blessing photo

indefinitely. But in dusty, smoky cities, the life of such a material in its clean fresh form is definitely limited.

About all you can do with floors is to minimize the noise that's generated there. Any of the synthetics such as asphalt, linoleum, and rubber tile are preferable to exposed concrete in this regard.

In corridors, a particularly strong case can be made for rubber tile since a large part of the noise generated in the corridor is from the pounding of feet. Anything that will minimize the source of that noise is desirable.

Much has been said about the acoustical value of light-weight concrete block as a finished surface material for classrooms, auditoriums, gymnasiums, and the like. Because of its slightly rough surface it undoubtedly does do some good, but nothing that we have ever seen is good enough to justify the claims made for it in this regard. You can have a big, rectangular gymnasium finished in this material and have the dandiest set of echoes you ever heard. To say that it is better than hard-finished plaster or glazed terra cotta is probably accurate, but a modest standard acoustically. Use exposed block but don't expect it to be quiet enough. It won't do the job alone.

So much for reducing the noise level in a room by cutting down the reflection and reverberation. There are two other important phases to this problem. The first of these is transmission of uninvited sound from one room to another through the wall. The principal thing which prevents sound from going from one room to another is just sheer mass. Remember that sound is mechanical energy, and the vibrating air on one side of a wall has to vibrate that wall with sufficient vio-

lence so that it, in turn, will set in motion the particles of air on the other side. For this reason no good light-weight temporary acoustical wall has yet found its way into the market, although a field for conquest exists for whoever can take the principle of the Maxim silencer into the design of a light-weight wall. Where it is important to reduce sound transmission, such as between the practice rooms in a music department, it can be done either by putting up a masonry wall with plaster on each side, or by using a frame wall which is, in effect, two walls. The studs of one support the surface on one side, and the studs of the other support the surface on the other side, thus minimizing the continuous mechanical contact of one side of the wall with the other.

For practical purposes, between normal classrooms the tile or gypsum wall or concrete block wall has seemed to be adequate for all average conditions. A plus value can be added by extending the classroom wall beyond the outer surface of the building in a series of "jibs." Then when the windows are opened in nice weather, the sound cannot go as readily from one room to another via outdoors.

The second problem is making the sound go where you want it, sometimes increasing its brilliance. There are many rooms where good hearing is a primary consideration. In such spaces acoustical correction must go far beyond mere sound-deadening. In a small auditorium the objective of acoustical treatment is not necessarily to reduce noise but to direct and emphasize that sound which has the priority on people's attention. For instance, a small children's auditorium can be positively designed to make it possible for little Mary, age 6, to announce the Class Play in a natural tone of voice. In this way she does not have to compound the stage fright from which she is already suffering with the self-consciousness and strain of speaking unnaturally to reach a large audience. Similarly for the Christmas play and the children's choral group. Small children (and some grown-ups) do not have strong voices or pleasant ones when they try to force them.

Mechanical amplification is neither an adequate nor a good answer in developing a natural relationship between participants and audience. It actually interposes a barrier and prevents the projection of personality. Therefore, a room which uses such surfaces as the ceiling and walls to reinforce the sound reaching the farther seats in the audience, and which reflects some of the sound over the heads of the front rows which need no help, permits little Mary to speak effectively even before she has gotten over her initial fright.

We strongly recommend consultation with people who know acoustics quantitatively and technically for any major room, where this factor is paramount. The general principles are that the stage end of a speaking room (auditorium, etc.) should be reflective and brilliant like a megaphone. The end of the room away from this speaking source should be absorptive in order that the long sound travel will not come bouncing back to make a discernible echo while the next word is being spoken. Lastly, voice of painful experience: don't let the ceilings be parallel to the floor, and don't let the side walls get built to set up paired parallel surfaces. These rooms are generally big enough so that the echo can bounce back and forth and be very disturbing under such situations. To oversimplify the principle involved, you want a megaphone shouting into a pile of cotton. A second best solution is to leave the walls out, as in the Berkshire Auditorium designed by Saarinen, where the secondary sound floats out among the trees and never gets a chance to echo back around the room.

The Architectural Forum, November, 1948, presented the best analysis of the acoustical problem we have seen. Read it.

CHAPTER 8: Technical Aspects of Educational Buildings, Part 2

Fenestration

Some comment as to where windows can be applied and employed has been made under the heading of Lighting. Perhaps a few comments about the window itself, under the mouthfilling heading of "Fenestration" are in order.

The temptation at this point is to subdivide all windows into categories A and B, like everything else—those which do, and those which do not. In this case category A deals with those which do combine the function of lighting and ventilation; and B with those which separate the function of lighting and ventilation.

The world is full of double hung windows. Hundreds of thousands of people have worked on their refinement and manufacture until it seems as if almost nothing more could be done or said about them. They had their origin in the necessities of masonry construction and the openings which could be comfortably provided within such construction. It would be laboring the obvious to point out that they can be conveniently washed, that they can be sized to small, medium, or fairly large openings, and that replacement parts for them can be bought in any hardware store. So much for the plus side.

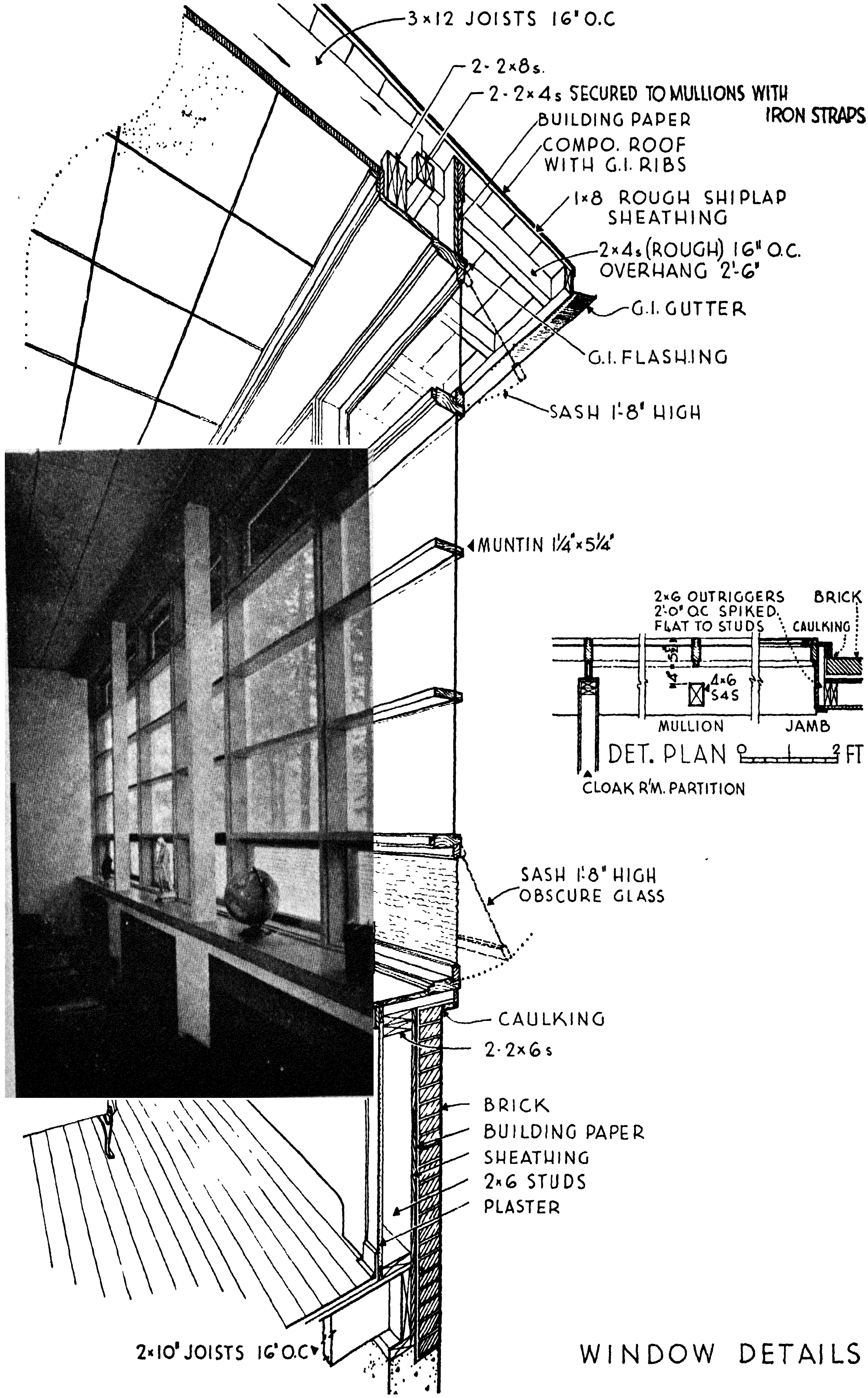
Double hung windows are cheap for much the same reason that automobiles are cheap. It's not because they're simple. They are not. They're very complex. But they have been mass-produced and competitively produced. For this reason they retain cost advantages over designs which are inherently much simpler and which are, perhaps, improvements on them. In a traditional building which depends for its design on the alternation of window openings and masonry intervals in rhythmic pattern, there is probably very little reason to try to improve on them. Then why bother? Presumably bother because of some of the things you cannot do with the double hung window. Let's come back to that in just a minute.

In lighting a schoolroom with windows, one of the objects is to cut down on the black-white-black-white alternation of gray spots and black voids set up by windows in a masonry wall. The impractical opposite extreme of this is to have an unbroken wall with a single sheet of plate glass from end wall to end wall of a room, casting as nearly no shadow as possible into that room. This is not merely to get quantity of light, but to avoid contrast, and is, of course, unbuildable in most instances.

The approximation of this, which is the so-called "strip" or continuous window that is finding its way into current architectural expression with rising insistency, is not a mere designer's whim. It has as its objective a workable, clean, simple wall, unmarred by contrast, which will eliminate the visual limits of a room and permit the people within it to partake of the surroundings to that room in their visual and psychological consciousness. In short, the ceilings, the walls, and, when possible, even the floor itself, should slip past the window wall and out into the outdoors when such design is appropriate.

And now, come back to the double hung window. It requires ugly, horizontal bars. It requires bulky boxes for the counterweights which lie behind the masonry pier. In contrast, in the strip window where a series of double hung windows are put beside each other, the end product from the outside is a clumsy appearing bank of heavy-mullioned and graceless openings. From the inside, far more importantly, intervals of light alternate with bulky, clumsy black intervals—black only because regardless of their own color they are seen against the light.

The strip window, which is sometimes thought of as a stylistic device of the contemporary school of architecture, is in reality one of the attempts to combat the awkward,



Window construction, Sacred Heart School. Pietro Belluschi architect. Courtesy *Progressive Architecture*.

interrupted, ponderous grouping of windows which was the only possible way of doing things during the centuries when masonry practice limited the size of openings.

Once you leave the double hung window you may travel the long and controversial path through the maze of casement windows, inswinging, outswinging, transom type, fixed windows, pivoted windows, sliding windows, and their sisters, cousins, and aunts. A case could be made for and against each of these variations. Inswinging casements leak sometimes. Outswinging casements are hard to wash. Furthermore, the outswinging casement scoops in more air than a double hung window on days when it's pleasant and you want air—and scoops in more rain and disturbance on the days when it isn't.

For the readers of this book who are architects, we do not presume to give the case for and against each kind of window that the reader has probably already studied to his complete personal satisfaction. We would emphasize, however, that installations (in temperate climates) where most of the glass is fixed and is contained by divisions as thin and delicate as possible have been most satisfactory. And it is improved where it is supplemented by transom type sash placed with a view to admitting air comfortably and in adequate quantities, the sash to be inswinging and bottom-hinged near the bottom of the glass opening to direct the air upward as it enters the room, and to be outswinging and top-hinged at the top. The effectiveness and and comfort are materially enhanced when used in connection with overhangs and other exterior protective devices which mitigate the effects of wind, rain and glare while letting the air pass freely through the openings designated for this purpose.

The large fixed windows, we feel, further exploit the inherent quality and virtue of glass. They exclude the weather and still permit the eye and mind to pass comfortably from indoors to out without filtering it through a prism-like network of tiny division elements.

A few comments on sill height. Classrooms throughout America have been designed with high sills for one purpose only—to trap the student's eye as it wandered toward the tempting out of doors, and turn it back in revulsion toward the unattractive but still preferable textbook in front of him.

The people who dreamed that one up underestimated the imagination of a youngster which is capable of hurdling that sill even though a visual barrier has been physically interposed. The high sill also had the peculiar unvirtue of turning the eye to the outdoor area of greatest brightness—the sky.

The National Council on Schoolhouse Construction is realistic when it urges that window sills should be the eye height of seated pupils. Ideally they would be lower.

The high sill has been fastened upon classroom design by many of the gadgets which have been integrated into it, such as unit heaters, which cannot be cut down except at great pain and expense. A partial solution to this is to vary the sill height in proportion to the room itself—some being low to permit the eye to pass the wall barrier and travel on to the garden or feeding table on the ground outside. The low sill is an extension of the same thought as the ceiling flush with the window heads. It breaks the psychological barrier between indoors and outdoors and makes the room seem larger in so doing.

In one school system every teacher, without regard for the grade she taught, requested, in effect, a bay window where the glass would reach the ground for some of the reasons suggested above, and the additional reason that it provided a place for gathering children about her for group committee and class meetings or for story hour. In that particular system the objective was accomplished by the continuous corner window, extending down to the back of the low bench which was the sill in that case. The bay window and the working window were the same and have been proven successful, but the thing for which those teachers were unquestionably groping was in part, at least, the removal of the visual barrier between the indoors and outdoors at this line.

It is beyond the province of this book to recommend a right type of window in terms of material—whether it should be made of wood or aluminum or steel is largely a local and financial problem. Suffice it to say that metal tends to reduce the problem of the large shadow-casting divisions more than wood seems to have done. Like every other material available to building, and every other application, no one of them is without fault, and no element in a building can be considered without weighing its maintenance qualities.

An entirely new point of view has become possible in a field of fenestration, initiated and made possible by the concept of separating the functions of light and ventilation. Light and air do not have to come through the same opening, and that can lead to some very interesting places. For instance, in one school, practically all the principal window wall is

installed in large fixed lights of double glass of a patented material which uses two sheets of glass separated and sealed at the edges to make, in effect, a permanent storm sash. This is a highly advertised product of two of the principal glass manufacturers. These big sheets are cleanable on the outside by a hose and squeegee and can be done fast and simply like store windows. Similarly on the inside they do not burden the maintenance man with fussing with endless little corners. They do not burden the architect's budget with an infinite amount of fussy, expensive hardware either.

Then, in order to get air into the room, an auxiliary opening is provided below this fixed piece of insulated glass. This opening has, on the inside, an insulated door which opens to form a directional baffle for the air which passes through it. Next to this, in turn, is a fly screen kept permanently in place. Outside of this, in turn, are louvers (inclined surfaces like those of the traditional New England shutter), designed to shed water but admit air. Any householder who has ever taken down screens and put up storm sash and done all the attendant window-washing and painting will see at once the point in having each of these elements permanently in place and instantly available at all times of the year. For the teacher who wishes to use slidefilms and movies in the classroom, there is the feature that the room can be darkened by curtains which do not have to cover the ventilator opening, and she can have a dark, airy room at any time.

Speaking of darkening rooms, here's something for the glass researchers. Why not a glass that admits light in quantities that can be controlled? We know of the polarizing headlamp lenses and the suggestion of counter-polarized windshields. How about glass, block or multiple sheet, which adjusts automatically to the light hitting it from the outside, admitting a fixed quantity? Or more and better, one which can also be manually adjusted from the inside to exclude all light? Yes, we know only a little is required to see how impossible it is. But is it? We can dream, can't we? And every once in a while there comes along an Edison or a Marconi and the impossible is not only possible, but an accomplished fact. "The difficult we do at once. The impossible takes a little more time." That's American, isn't it?

Plumbing

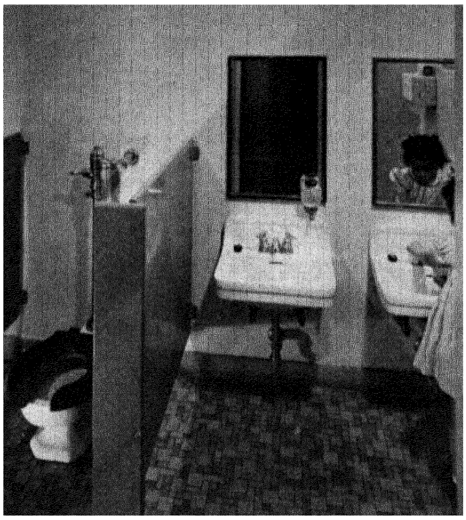
Upon his retirement, a superintendent in a neighboring suburb looked back over his achievements. To the assembled well wishers who were there for the occasion he made a little speech about what he believed to be his contribution to the schools of that particular suburb. Forty years before when he had come there, he said, he found the "plumbing" out back of the school contained in two auxiliary structures. In his first fifteen years this situation was corrected and replaced by basement toilet rooms. In the next fifteen years these, in turn, were replaced by toilet rooms on the first and second floors. This, he said in conclusion, just about summarized his contribution to the schools of that system. In the school which was later built and named for him to honor the achievements he had not listed, the toilet facilities adjoined each classroom. This illustrates what is commonly called "a trend."

The revulsion from outdoor "plumbing" led to excess in another direction, as most reactions seem to do. The enthusiasm for plumbing which became the pride and goal of most of our American civilization during the twenties expressed itself in gaudy tile bathrooms in residences and in fine, monumental, neatly arranged toilet rooms in institutional buildings. The rows upon rows of gleaming fixtures that adorned the better schools built between 1915 and 1930 were a source of pride to anyone with a statistical mind. They were the architectural expression of a philosophy which said, in effect, that this, like every other phase of school life, was an organized activity to be engaged upon simultaneously by whole classes and whole schools at a time. Recess was partly devoted to this purpose, and many readers will remember the lineup, and the teacher admitting four or six at a time to this highly regularized activity.

Most plumbing designed then, and most codes now, appear to be grossly excessive in their requirements until you remember that they presumed that their occupancy would be a matter of simultaneous onslaught with long periods of disuse between. So much for how they got that way.

Many of the most serious discipline problems in school administration arise from the misuse of large group toilets. The inefficiency of their central location, distant from the classroom, is obvious in terms of lost time. The application of this hard-bought experience in high schools has been the spreading of smaller toilet rooms placed at more frequent intervals throughout a building, and in elementary schools individual room toilets at some or all grade levels.

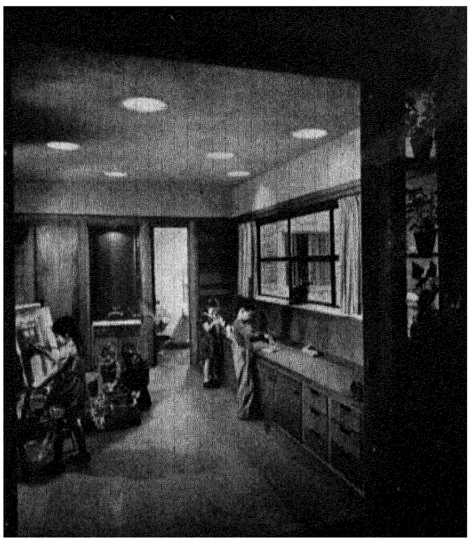
The negative reasons for using smaller



Wash-rooms and toilets are child-sized. Crow Island School, Winnetka, Ill. Eliel Saarinen-Eero Saarinen, Perkins, Wheeler & Will architects. Hedrich-Blessing photo.

Toilet-washrooms for boys and girls adjoin workshop space in the upper grades in Crow Island School. Perkins & Will architects. Hedrich-Blessing photo.

Tot-size students, tot-size workshop equipment, tot-size plumbing also at Crow Island. Hedrich-Blessing photo.



toilet rooms more frequently placed and individual toilet rooms, where possible, have already been given. From the purely practical standpoint, this policy requires actually fewer total fixtures than the mass facility had formerly required, so that the apparently greater cost of additional pipe runs, etc., is offset by a lower total number of installations. Much more to the point, however, are the positive gains in time-saving, discipline, and convenience. In the lower grades the use of this facility is actually an element of education, and the correct use or misuse of the facility by an individual is instantly apparent.

In one installation individual room toilets were installed up through and including the sixth grade. The Board and the administrator who had initiated this requirement in the program were considerably less than confident as to the outcome . . . so much so that they ordered additional space to be provided in each room in the form of a storage closet with floors all prepared to receive pipes, if a second toilet was required to provide a room for each sex. The building was built and opened for inspection, and the Board members held their hats awaiting the storm. The storm never happened, then or later, and the building is in its ninth year as of this writing. The parents, and more important the children, saw instantly the parallel between this and the residence situation where the "bathroom" is used in a family situation by one person at a time, and no attempt is made to provide different facilities. The Board members were almost disappointed that they were never called upon to defend the idea that they had feared was controversial.

As the building has been used in the succeeding years, the question has been asked repeatedly about student self-consciousness and embarrassment. This, too, has not happened. Children, for some reason, accept more readily than adults that the human kidney is here to stay and do not become self-conscious about it until we adults train them to be so. We make a firm recommendation. The individual room toilet, at least in the lower grades, is a good idea and will work and should be installed when circumstances permit.

Voice of experience: The very small toilets sometimes sold for kindergarten and nursery school use are not worth buying. Visitors to the school look at them and think they are too cute for words, but actually they are too small for comfort and for use. The intermediate size toilet seems to be as small as it is practical to go in this direction, and normal size is applicable and usable after the third or fourth grade without any question. (Another argu-

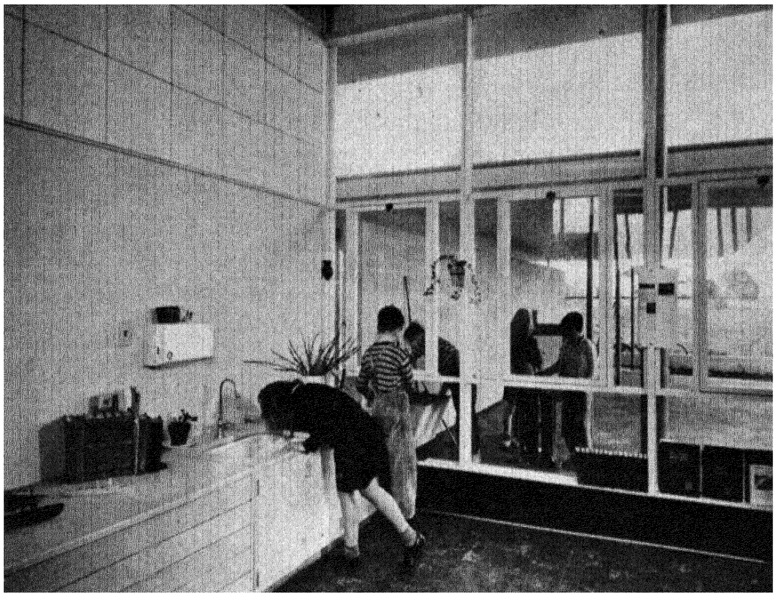
ment, by the way, for sizing the toilet to the particular room and age group it is to serve rather than to include small facilities in a general toilet room.)

Drinking Fountains

The drinking fountain has for many years found its way into the corridor at a point near the general toilet facilities, the reason for this obviously being to create a relatively short run of pipe and therefore serve the end of mechanical convenience.

There are many good reasons why there should still be corridor drinking fountains, and the principal comments that should be made about them are that they should be recessed so that the fountain itself does not project into the line of traffic as a possible instrument of injury to the students, and further, that it has provided a vehicle for sentimental souls to make an architectural feature of the tile recess, complete with boy holding fish done in genuine imitation sculpture. It is seriously doubted whether anyone responds to this particular phase of art.

The trend as of 1949 was sharply in the direction of making the process of drinking water less glamorous and more available—in fact, available in each classroom. This was doubly practical since the growing strength of activity programs has required the placing of sink and hot and cold running water immediately available to classroom activities. A drinking fountain, therefore, appears to have become a third element with the classroom sink, adding to the hot and cold water faucets which are there for its basic use. How did that sink get into this paragraph?



Drinking fountains within the classroom eliminate corridor travel. Sunnybrae School, San Mateo, Cal. Franklin & Kump architects John H. Lohman photo.

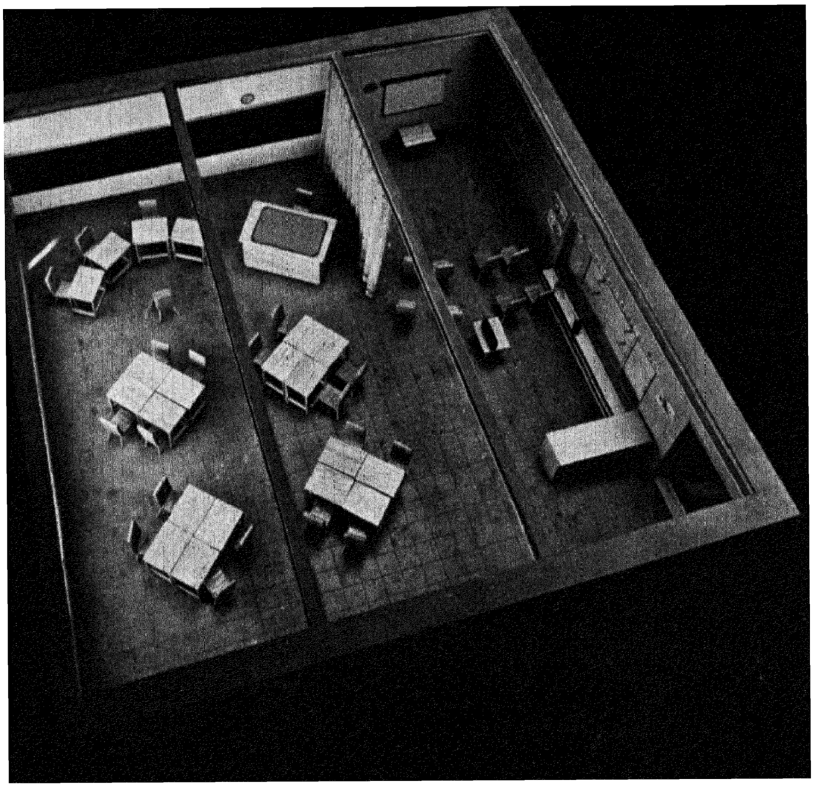
Sinks in a classroom for working and for washing. Hedrich-Blessing photo.

Sinks

The only comment is that there seems to be endless uses for readily available water in the everyday life of most schoolrooms, if for nothing else than just to have water for cleaning and maintenance. Remember that schools are becoming not homelike but, happily, shop-like places where work can be carried on efficiently and joyously, and hot and cold running water seems to pertain to many jobs. It is also considered useful for washing the face and hands and is a supplement to the individual room toilet facility at the lower grades, although that toilet itself should, of course, have a lavatory within the enclosed room.

The janitor's closets, containing space for mops, tools, equipment and supplies and a slop sink, should be spaced at intervals throughout any building in the sheer interest of making an increasingly expensive and im-

portant man effective in his work. The design of this sink should be determined more by the janitor's real needs than any sales representation. No defense is needed for the proposition that a highly skilled and increasingly highly paid man should be given good tools in order for the employer to get his money back on that man. So much for slop sinks and the correlated problems.



One way of providing for easy darkening of the part of the large, one-window walled classroom is to use a curtained cover for the projection screen. Perkins & Will architects. Courtesy *See and Hear.*

Facilities for Radio, Motion Pictures, and Television

Controversies consume endless hours of educational conferences deciding the merits of motion pictures, of "visual projected material" in individual classrooms versus rooms especially for that purpose, and whether to have a centrally controlled panel board with buttons and dials with all the latest gadgets of communication centralized nearest the administrator's desk.

The argument on movies and slidefilms runs something like this. You want it in the individual classroom so that it can be used wherever and whenever it is needed. On the other hand, it is urged that for most moving picture aids, it is more important to show them in a room especially designed for the purpose (and which is less expensive to provide) than fixing every room for the purpose.

Anyhow, it is urged, major educational documentary films such as "The River" and "The City" are enough of an event and are expensive enough so that they justify having larger groups than a class see them at one time. Hence, a visual aids or projection auditorium should be used by all the classes instead of by any one of them.

The special room for the purpose of audio-visual is something more than a lecture demonstration room with good sight lines to a screen, where a person can demonstrate or show pictures and point out features from them with comfort and efficiency. It should be provided with conduit and wiring to permit the widest possible choice of mechanical equipment—specifically a conduit from the probable location of the projector to a point near the screen for the sound equipment. In addition, a room which is to be completely darkened must do a particularly adequate job of ventilation.

A further argument is that you can use better equipment in such a room with more light being pumped onto the screen through appropriate instruments, and get better pictures than in individual classrooms.

We suggest that when money permits the best compromise is to do both. Both means

that you should be able to darken a classroom sufficiently so that such work is possible, and that there should be somewhere in the building a small auditorium suitable for special classes, dramatic and music rehearsals, as well as the myriad of things grouped under the title of "audio-visual aids."

A distinction may be made in age groups in this regard. It can be argued that the excessively bright, daylighted classrooms of the earlier school years are less appropriate for darkening and use of projection material than the classrooms which are appropriate to older groups. Therefore, perhaps the centralized room, which is also the small auditorium, etc., is more appropriate for little children's schools than for the low ceilinged, artificially lighted deep spaces advocated elsewhere in this chapter under Lighting.

A simple darkening device which has been found successful in the curtaining of individual classrooms for this purpose is as follows: Install two curtain tracks parallel to window wall or walls. On the track nearest the glass hang a translucent curtain of inexpensive material—muslin, cotton, etc.—to be used as a "glass curtain" in decorator's language. The purpose of this is to diffuse light and eliminate the inconvenience of sun patches on desks. On the inside track hang an opaque curtain of blue denim, as in overalls, which can be pulled across the windows to exclude the light. When it is retracted to its open position it serves as part of the decoration of the room. This, in effect, closes the historical cycle of curtains which started out as a means of closing an opening and excluding light, and progressed up through barbarous levels of ostentation and uselessness until they were mere items of decoration. Now, in their return to usefulness, they also accomplish the useless and pleasant function formerly achieved by "drapes."

Intercommunication

The argument surrounding intercommunication takes, on one hand, the position of easy communication, control and cooperation, and is best achieved by having the whole place wired with gadgets where everybody can talk to everybody and everybody can listen to everybody. A salesman can make a particularly vivid presentation on this point. We revel our bias by saying that Mr. Hitler's Gestapo made use of similar devices.

There probably is a legitimate function for announcements and paging of individuals which can be accomplished by such devices. However, the piping of particular radio programs into the rooms can be done equally well and probably cheaper by individual room radios, and the room, in that respect at least, maintains its independence, autonomy, and freedom of choice. We say that is good, in a democratic society.

We would like to mitigate our cynicism about gadgets in the following details. There are so many radio stations broadcasting so many diverse programs, that the law of averages insures a bit of radio fare now and then which is worth saving and exposing the growing mind to. For example, excerpts from great plays, done with professional skill by leading actors, can be used to demonstrate good diction to speech and theater students; noteworthy news broadcasts can point up studies of current events; recordings, of course, can be reused to punch home music appreciation and music memory courses; discussion programs such as the University of Chicago Round Table, "Invitation to Learning" and "Town Hall of the Air" can be used to supplement many learning activities.

The architectural expression of this function is an acoustically-treated rehearsal or practice room which can double as part of the Music Department, as well as English and Speech.

Regarding television, the authors are frankly unprepared. Schools may or may not buy television equipment. On the record of radio and movies, it is by no means assured that the programs which will be pumped out of the television studio will become the type of educational force that will fit into the curriculum, although it may be useful in teaching students to distinguish between phony and genuine wrestling matches.

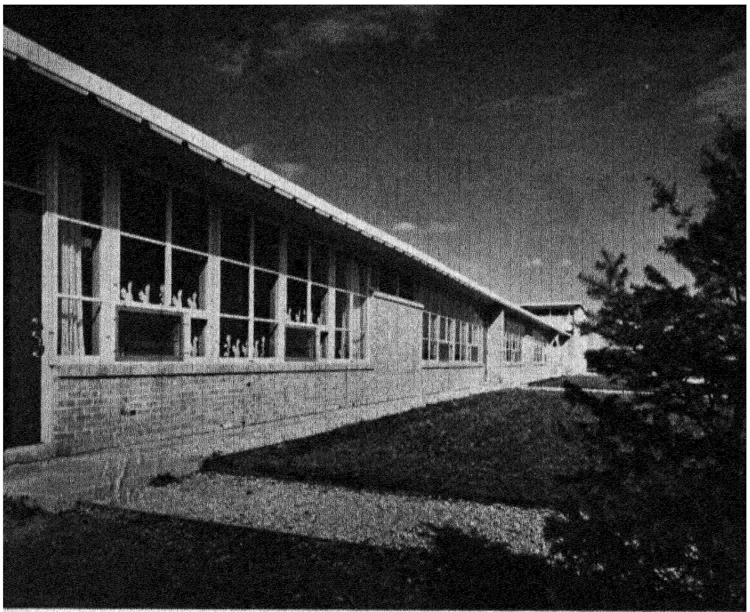
Exits

There was once a man who kept cats. His current establishment consisted of a mother cat and three kittens. The door was cut with one large aperture and three small ones. The man was asked, "Couldn't the small cats go through the large opening as well as the large cat?" "Well," was the reply, "they could, but when I say 'Scat!' I mean 'Scat!' "

This is a story with a moral. It relates to buildings on one floor with exits out of each room, where "Scat!" is shouted by a possible fire, a possible panic, and, let's be grim about it, a possible air raid.

The individual room exit has obvious safety implications, but beyond that, of course, are the additional advantages of being able to tie outdoor space to classroom space in usable form, and to change the character of the cor-

Individual classroom exits opening to the out-of-doors are not only simple and convenient—they are safe. Indian Lake School, district No. 89, Barrington, Ill. Perkins & Will architects. Hedrich-Blessing photo.



If there must be stairways, they must be safe: ample and well-lighted. Note: people in panic always run toward the light. Ganster & Hennighausen architects.

ridor itself. If a school is operated as a series of independent units tied together by a corridor, and if that exit door also becomes a used entrance door, the corridor changes its function from that of a main artery to a mere connection and means of communication from one unit to another. This, in turn, enhances its usefulness as a coat room, art gallery, and so on.

Thus, the classroom door to the outdoors is an element in designing the corridor and other exits of the building which touch it in no direct way. Like every other problem in building, every decision on a detail involves a chain reaction of decisions which jump from one point to the next to the next until the final decision resulting from any earlier one may turn up in the most distant and surprising parts of a building.

As far as the corridor exits themselves are concerned, they should be light. People in the relative dimness of a normal corridor move toward the light with the instinct of someone finding his way out toward the mouth of a cave. With this in mind it is well to have the exit door and stair elements of the circulation system in a building the most abundantly lighted parts of that system. Glass-enclosed stair towers on multi-story buildings, and glass exit doors serve more purposes than mere architectural exuberance, although they're all right for that, too. The hazard in schools, even in combustible ones, is panic more than fire, and every device, including adequate exits, which tends to minimize that panic and minimize the confusion of a tense situation, is a safety element.

Perhaps this is a good time to recall earlier comments on lighting and acoustics—that a panic is less likely in a well-lighted quiet corridor where directions can be heard and where the objective exit can be easily seen.

The reader is certainly familiar with the panic hardware which is a requirement in most states and a very proper one. The principle is simply that pressure against it, such as could be generated by a crowd pushing against the door, will certainly spring the lock and not permit the person in front to get so crushed that he cannot operate the hardware. So far no better hardware form than the panic bar has appeared but in any situation where weight or hands can be thrown against a glass surface, it is a minimum recommendation to install wire glass to prevent such shattering.

A source of danger in any school building is the door from the classroom into the corridor. If it is inswinging it offers the possibility of trapping people within the room. If

it is outswinging it has the possibility of swinging suddenly out into the corridor traffic and hitting somebody. To avoid this latter it is customary to design deep recesses to permit the door to swing out and still not intrude into the corridor. This is space consuming. Query: Is there some device, acoustical and visual, which would secure for the classrooms the required privacy and individual identity and which would minimize the disturbing effects from corridor to classroom and vice versa, which would not require an operating door leaf? The authors frankly do not know how to do this, but suggest that it would be a good thing if somebody could figure a way.

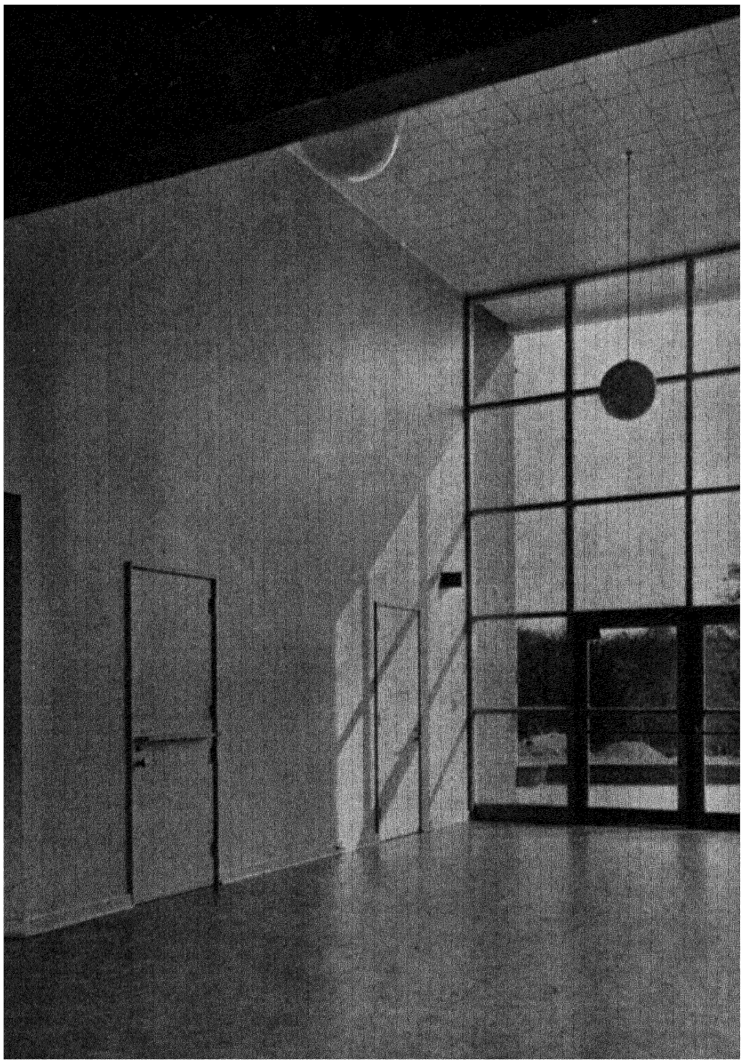
Everything that has been said about exits in general applies with somewhat increased force to the main entrance itself. The trend toward clear glass slabs for doors in this position has some very practical merit if one can disregard such irritating points as cost. Clear glass certainly accomplishes the problem of moving toward the light in a most effective way.

It may also be added that most main entrances are overdone. The need for three pairs of 3 foot doors, making a total possible opening of 18 feet, in an elementary building with less than 500 students, is probably wasteful and unnecessary. In one such building with which the authors are familiar, one pair is all that ever gets used, and it is doubtful if more than two pairs would be used in a lock-step formalized building where the entire school was dismissed simultaneously. It is possible to be intemperate even in the matter of exits.

Floors

Under stress of wartime economy we once put down a floor whose finish was simply the smooth concrete with a little color mixed in. This was all that could be had so there was no problem of choice. If this books serves to keep the reader from doing likewise with any less excuse than a war to justify it, it will have served a useful purpose. A concrete floor in a classroom will be a failure. It is dusty, tiring, and above all, noisy. In case this has not been made clear already, don't do it.

To mitigate these dire conditions several materials are available, and none of them are perfect. The great bulk of classroom floors are being finished in asphalt tile in various grades and colors and patterns. The authors caution against violent, intrusive patterns which force themselves on the attention of the beholder and which, from the purely visual standpoint, set up undesirable contrasts



There's no doubt as to where in the corridor *this* exit is—it says "outdoors"! Elementary School, Burlington, Conn. Moore & Salisbury architects.

which might seem "spots before the eyes" by the end of an intense day.

Linoleum has been popular and fairly successful for many years. A variation on linoleum floors where patterned inserts have been incorporated with varying degrees of whimsy run into another kind of failure beside that of mere busy pattern. Like murals and other intrusive bits of static illustration, they tend to intrude and limit the fancy and the imagination of the people who occupy the room. Styles change in games, and an inlaid shuffleboard court may merely be unpleasant or anachronistic before the floor wears out.

A case can be made for wood floors, preferably maple, and perhaps rubber tile and mastic should also receive consideration. This method is rarely within the financial reach of most routine applications.

Cork tile, when it is available both physically and economically, can provide a warm, attractive, quiet floor. It is particularly applicable to libraries and is also appropriate to rooms where a particular architectural effect is desired—a warm, dark brown, wood paneling type of room—where "architecture" outweighs the utility aspects as in a memorial room or Board of Education meeting room, etc. Cork is a beautiful luxury material and depends on maintenance to prevent darkening and disintegration.

From the sheer point of practicality, whichever one of these surfacing materials is used, color is a consideration of first importance. It should be relatively light—if possible, as light in value as the natural woodwork with which desk tops may be finished. This relates to the conditions of seeing, and, believe it or not, of maintenance. On this latter point a slight marbling in light colors is far more practical than unmarked surfaces of dark colors which show dust much more readily. The esthetic importance of light valued floor surfaces can scarcely be overstated. The corollary that they are not as impractical as darker colors may surprise some, but the record is clear.

The reason for the ascendancy in schools of asphalt tile over linoleum, which is a proven and successful material, probably has something to do with the fact that materials were not available for the manufacture of linoleum during the time when the Spaniards were too busy fighting to harvest it. Both of these materials, when properly applied and properly maintained, have an enviable record for endurance and resistance to the "patter of tiny feet." Not so impressive is their record against scars from the legs of furniture, piano casters and the like. In hot weather these things make a deep impression.

Wood floors in classrooms have some advantages but are usually burdensome from the maintenance point of view because of the necessity for moving furniture and muddy shoes across them with resulting blemishes. Also there is a tendency toward noise. Rubber tile is probably not particularly applicable unless there are special conditions of a particular room which justify its greater resilience and quietness.

The principal thing to be accomplished by flooring material in shops is to provide a surface which is comfortable and not tiring to the workers, and perhaps fully as important, a surface which will not chip and mar tools and edged material which fall to the floor. Therefore, a surface of bituminous road paving material, wooden block floors in their various forms, or mastic tile are all possible floors for this use, and the choice should be made on a basis of cost.

Gymnasium floors are quite a different matter. The problem here is not to resist the onslaught of roughshod furniture, but to provide a resilient yet slip-proof surface for rubber shod athletes of varying age groups. The problem of traction is primarily one for the maintenance man who applies the successive coats of sealer and polish to this floor, but the problem of resilience is inherent in the material itself. With this in mind the overwhelming body of prejudice is in favor of wood for this surface.

Many gymnasiums have been floored with synthetics such as asphalt tile, rubber tile or linoleum, and there are some superb installations of mastic flooring such as that of the University of Rochester in New York. But the liveness, the light appearance, the low conductivity (it feels warm) of wood have made this, if not the best, at least the most popular flooring material. There are many applications. Grain blocks have been employed, manufactured blocks combining several pieces of flooring are sometimes attempted, although large areas tend to give trouble with swelling during hot, humid weather.

The pleasantest floor which we have observed is in the gymnasium of the Junior College of Ventura, California. Basically what has been done is a series of strips underneath the finished floor so arranged that they act as springs to increase the liveness of the floor. The strips fastened to the concrete are bridged by a second series which cross them at regularly spaced intervals, and a third se-

ries of strips cross them at the middle of their span, so that when the finished floor is applied, the sensation of springiness and liveness is accentuated in a very pleasant way. This is by no means the least expensive way to lay a floor, but, like so many other details, may be the one which will give meaning and success to the total effect.

Corridors have different kinds of jobs in different buildings, as will be discussed later. The floor for each job varies, but whether the corridor is to carry a particularly heavy load, whether it is connected with a playground surfaced with abrasive materials or mud, or whether it is to serve for wheeled traffic such as hand trucks as well as the feet of students, those special conditions will require special measures and must be met on an individual basis.

In general a very successful corridor flooring surface is rubber tile laid on concrete, if possible with a terrazzo border which may become a locker base on each side of that corridor. The advantages of rubber tile are its resilience and quietness, which are rivaled, but not matched in this particular, by linoleum and asphalt tile. Each of these materials will wear well provided they are properly maintained. Of all three, rubber tile is the most dependent upon intelligent maintenance since the wrong soap can very quickly destroy the surface and integrity of rubber.

The use of synthetics—rubber, asphalt or linoleum—over a wood floor base is a very touchy problem and should not be attempted unless a layer of magnesite or concrete sufficiently thick to resist the movement and the marking effects of the wood is introduced between the finish and the under floor. The essential condition of using them is a rigid base which will hold its smoothness and position. The purpose of the terrazzo edge is to resist the wear and bruising effects inherent in mopping and floor cleaning machinery and to give a clean appearing surface at that point, and also to avoid a joint at the intersection of the floor and wall which can trap dirt, soapy water, and generate stains. There are special conditions where floor tile to resist abrasives is appropriate and where bituminous cement mixes of various kinds are appropriate to resist the denting of metal wheels under hand trucks and pianos and the like when these are major elements in the corridor use.

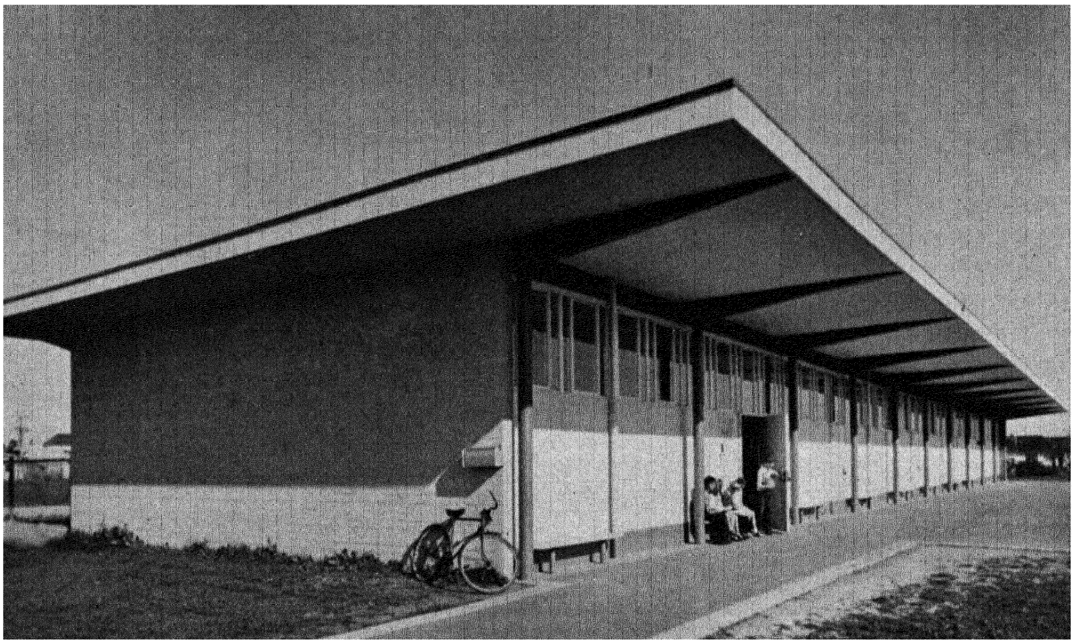
Toilet room and locker room floors demand as their prime qualities ease of cleaning, nonslippery and hygienic surfaces. They must be able to resist the roughest machinery and the strongest chemicals. Hence the variations on ceramic tile are at their most appropriate in this use, not only for floors but for such part of the wall as is liable to staining by soapy water. The synthetics in this application have the liability of joints which cannot be wholly successfully kept from stains and dirt. If they are used, a replacement program must be planned at predictable intervals.

Corridors

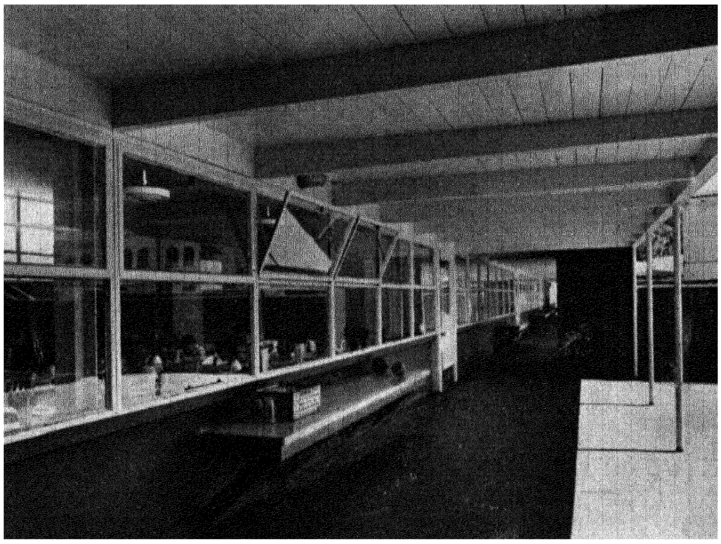
Schoolhouse corridors represent a major neglected opportunity. They do not have to be the way most of them are—dark, utilitarian, sometimes sanitary, instruments for getting from place to place. It is perfectly true they have the primary and very simply stated function of connecting rooms to each other under conditions protected from the weather. The extent to that protection is, of course, dictated by climate, and ranges everywhere from a canvas or sheet metal canopy to an internal part of the major structure itself.

The importance of a corridor actually changes, and the nature of its job changes with the age level to be served. This is obvious when you think of kindergarten and primary rooms as completed living structures in themselves, where nearly all of the activities of that group are conducted within the room, and the corridor serves as a means for parents and supervisory personnel to get from room to room. Contrast with this the arterial function of a major high school building, where the student body enters by a main approach and flows in torrent proportions into homerooms, and then between each period moves in conflicting currents to the places of specialized instruction. The variation is primarily one of intensity and frequency of use.

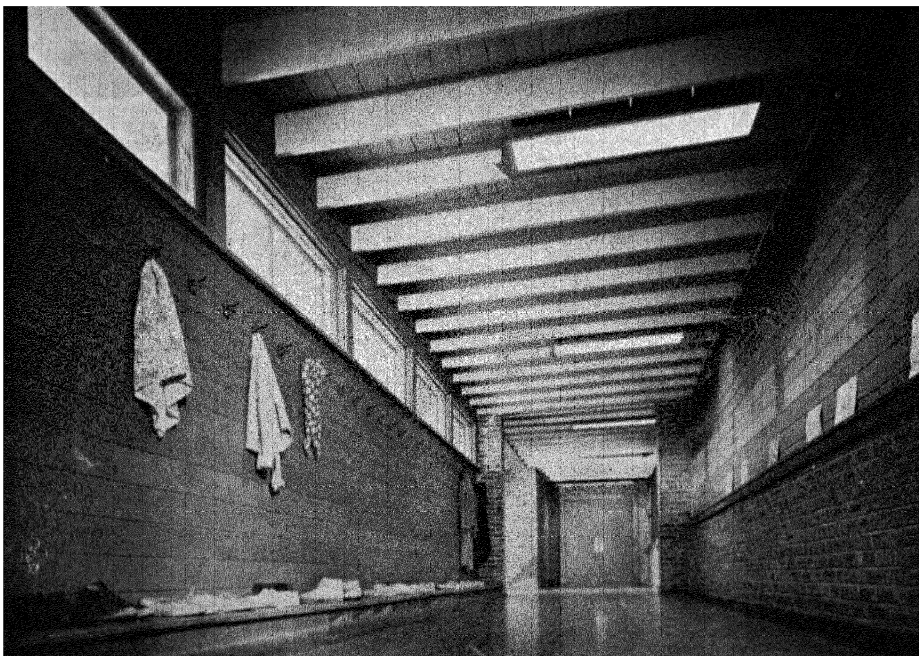
Elsewhere we have described some of the mechanical things which can be done to make corridors more successful in a utilitarian sense. Resilient floors to accomplish quietness and foot comfort, acoustical correction with the same objective in view, have been described. The pluses beyond mere utility give purpose to this section. A corridor which is merely well lighted is an end in itself and can have tremendous importance in establishing the atmosphere and character of a school. Abundant artificial light is a minimum means toward this end. Natural light is better—or artificial added to natural light. The fact that this is an aid to convenience is pleasant and probably important, but less so than the day-after-day impression left on the people's



Covered corridor at Sunnybrae School, San Mateo, Cal. Roof overhang also keeps out direct sunlight. Franklin & Kump architects. John H. Lohman photo.



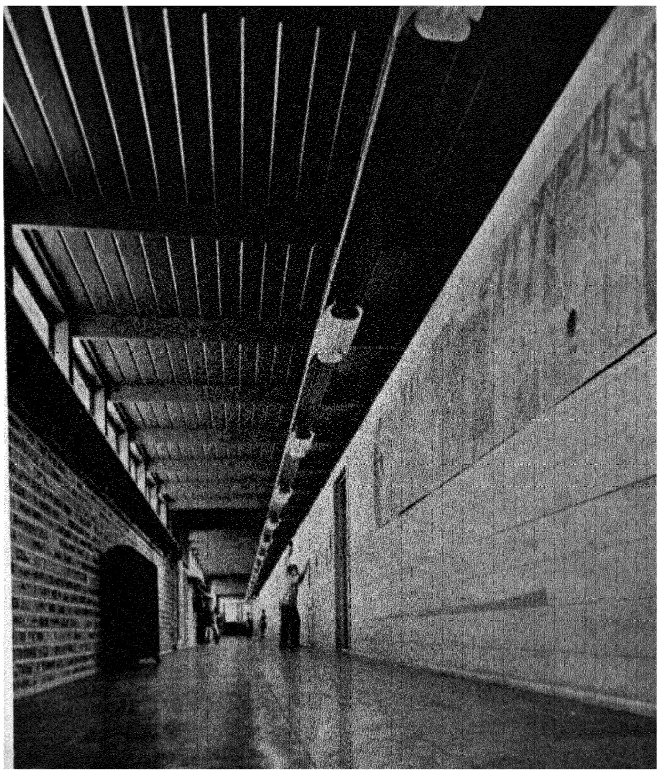
Simplicity keynotes this well-lighted corridor at the Indian Lake School, District No. 89. Barrington, Ill. Ample width provides space for clothing storage, left, and work display, right. Perkins & Will architects. Hedrich & Blessing photo.



Corridors roof in a little of the outdoors. School in Fairfax, Cal. Bamberger & Reid architects. Roger Sturtevant photo.

Acoustic plaster, two kinds of light fixtures alternating with porthole skylights feature this corridor which doubles as a locker room. Perkins & Will architects. Hedrich-Blessing photo.

The corridor can be more than an avenue for traffic; it can serve well as a meeting place, and as an exhibit gallery for student work. Rugen School, Glenview, Ill. Perkins & Will architects. Hedrich-Blessing photo.



minds who use it. Going to work through a long gloomy tunnel cannot help but have a negative effect. Natural light is harder to get, but worth quite a struggle.

In one-story buildings where classrooms are on either side of a corridor, there are some kinds of skylights which can accomplish this without too many of the unpleasant features to which skylights are liable. Pleasantest by all means is the corridor where classrooms are situated, either on one side or at intervals on the corridor, so that windows to the outdoors can be incorporated.

These notes are still primarily to the point of operating utility and the intangible of cheerfulness. They do not suggest the educational uses to which a corridor can be put. Everyone is familiar with corridor lockers and their use as a pupil base or station where clothing, books and paraphernalia can be kept. This in itself is a major justification for the space which stands so idle and so useless during class time.

The real use of a corridor as a place for exhibit and the bringing together of specialized subject matter toward the effect of a total educational effort can be implemented by visually extending the classroom into the corridor through the medium of exhibits, pictures, cases and literally a picture gallery above all the lockers. The usefulness of this space to demonstrate achievement, to introduce color, to break the barrier between the classroom housing Latin and the students who pass an otherwise forbidding door, represents an incompletely explored field in school building design.

One of the major purposes in the corridor of the single loaded Rugen School at Glenview, Illinois, was to provide a town art gal lery for photography exhibits, student exhibits ranging from finger painting to the trophies of summer travel. It was very simply done. On the outdoor side a continuous strip of windows was provided above the plane of lockers as yet unavailable for budgetary reasons. On the opposite side the interior surface is of soft pine boards, abundantly lighted by the windows and forming a perfect continuous tackboard suitable to receive an exhibit by the local photographer, succeeded next month by the finger paintings of the first grade, followed by a loan exhibit from the Museum of Modern Art. This works. The wall at Rugen has been so used for those particular bits of subject matter.

An inevitable question at this point is what happens with all the thumb tack holes? Don't they become unsightly? The answer seems to be that in soft wood this particular form

of deterioration is very slow, and with an occasional waxing every two or three years, the wall continues to look pleasant. Teachers in this particular system are under instructions to use, and if necessary, consume the building in the interest of teaching children rather than to preserve it in the conflicting interest of future taxpayers. The record is clear that the wood is an amazingly low maintenance cost material and is one of the most successful forms of bulletin board.

"Ideas for the exploitation of corridor space to make it a real educational asset have only begun to be explored."

Roofs

Keeping the rain out is a concept which needs no endorsement from us. Only to the extent that roofs either limit or free the planning and budgeting of schools is there any place for comment on these pages. For instance, the romantic, sloping mediaeval roofs with intersecting valleys and gables, quite aside from questions of expense, limit the shape and size of the building which goes on under them. For roofs to harmonize as they intersect from wing to wing of a building, the wings themselves must be related in size, not to their internal requirements, but to the externals of picture book design.

In contrast are the low-pitched or flat roofs associated with modern architecture which attain their importance and status not from deep-rooted responses to recalled tradition, but to the freedom which they give to the building underneath that roof. The flat roof, in theory at least, sets the stage and the pace for a completely fluid plan, responsive as possible to the varying requirements of varying parts of the building without the necessity of fitting an artificially regularized shape under a preconceived cap.

The stone gables, the slate covered roofs, the romanticism of many of the major eastern universities are delightful nostalgic things. They inspire etchings, wood cuts, Christmas cards, and are particularly at their best when seen with rainy reflections and umbrellas of the passerby reflected in the pavement and the towers lifting dimly into the mist above. But have you been inside them? And if you have, can you find your way out? As a way of generating nooks and crannies at great expense, they are unrivaled.

By contrast, here again is the case for a flat roof. If the object of the building is to create useful interior space with directness and reasonable cost, then gable roofs conflict and flat roofs do not. The sweeping horizontal lines of flat roofs and the emotional response which they evoke are frequently more satisfying after the beholder is accustomed to them than the more romantic and less defensible mannerisms of bygone centuries. But their real strength is in what you can get done under them. This, more than any other single feature of building, is the point which will press us gradually into an entirely new set of esthetic values. To repeat, flat roofs by their logic and insistence will ultimately be considered as beautiful as the presently more familiar forms. Familiarity seems to be a major factor in considerations of beauty. The flat roof is by no means the only right and correct solution to every building problem. Of course there are times when a single pitch or a gable or intersecting gables or any of the other myriad of roof forms—low, medium and high pitched—with any of the well known roofing surfaces is appropriate in a particular use. The single pitch roof is a particularly useful tool in the designer's hands when trying to work out a solution for bilateral light from above a low corridor. The double pitch with steep slope has well known properties for shedding snow and water rapidly and so on, so that to state that schools should always have flat roofs is thoroughly inaccurate.

We venture a few comments on the practicalities of schoolhouse roofs. Roofs require organized maintenance. In the case of school roofs the budget for this item can easily get lost in times of stress. The roof is too big to do what the householder does, which is to fix it himself. It is too small to do what the industrialist does, which is to keep a repair crew constantly at work and constantly budgeted on upkeep items. In this hinterland between the extremes, bad or at least irregular and interrupted maintenance must be presumed, and the roof must be designed to span inevitable periods of neglect. Until a roof actually leaks in a schoolhouse little action can be expected from the average school board. Therefore, it becomes part of the designer's job—an unusually important part—to design maintenance out of a school structure. With this in mind we bring up that old bugbear of maintenance men throughout the world—sheet metal. Gutters are an interminable nuisance. They collect leaves. They collect ice and snow. They get bent. They leak. And when they are situated to catch the run-off from a steep roof, all the foregoing may be underscored and reinforced. Therefore, the flat roof with the simplest kind of edging—perhaps a sheet metal gravel stop or something else of the sort—is sufficient. The design of laminated roofs, tar and gravel

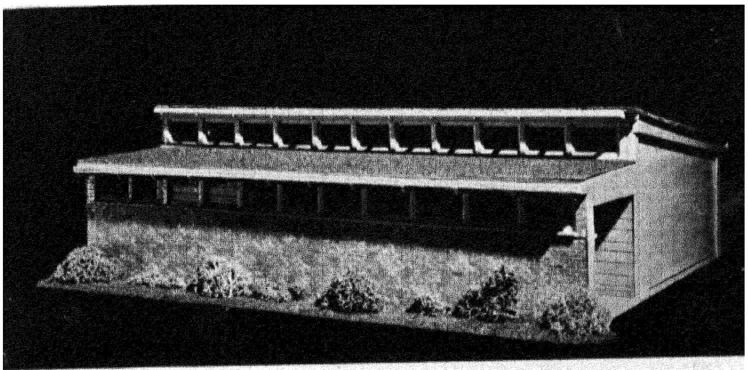
roofs and their like, is well understood. The water can be brought on the roof in from the edges toward interior downspouts which are kept warm and clear all winter long by the heat of the building they passed on through. By-product: the avoidance of icicles along the eaves and snow down the neck of the passerby. Some current designs, for the most practical reasons but with esthetic success, have actually pitched the roof inward toward the center of the building with the view to making the area over the center corridor itself become the gutter.

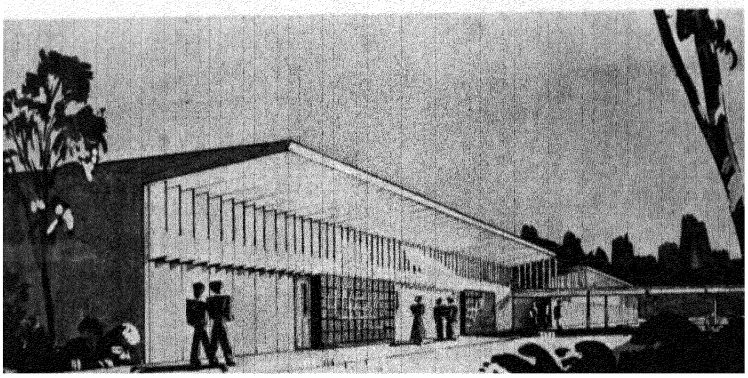
As an alternative, when interior downspouts are not practical for any one of several possible reasons, and where a long single pitch building is appropriate, it has been found practical to spill the water and snow off the edge onto a gravel-filled trench immediately below it. Shrubbery is planted outside of this, away from the building, so that again the maintenance headaches of carrying the water away by metal conductors is avoided. The economies of wartime construction forced such thinking on many buildings when sheet metal was unobtainable and many satisfying design achievements were the outcome.

One of the details which made this palatable on single pitch buildings was the use of the outrigger board, which is illustrated on many of the buildings shown in this book. At least partially it had it origin in shielding the offended eye from the necessarily ragged workmanship of a roof edge which finished in a messy edge of tar drippings. This particular device has some interesting lighting by-products which are discussed elsewhere in this chapter.

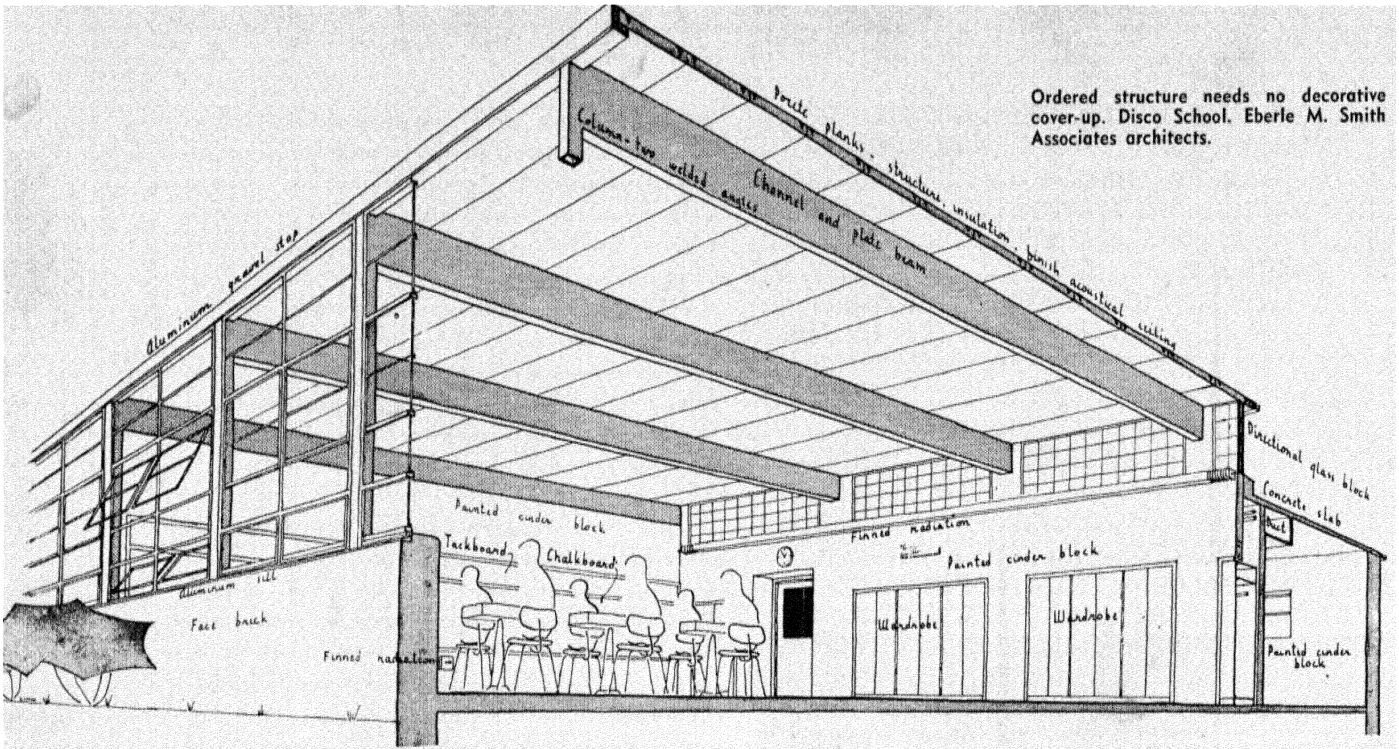
After sheet metal, and perhaps skylights, the next greatest nuisance in the design of buildings from the maintenance standpoint is the parapet—that article of embellishment used to make the height and proportion of a building more satisfying to someone's eye, and which went in another generation by the name of "drawing-board architecture." Fire departments in some cities still like them as a place to crouch behind as they work from building to building or on which to hang their ladders, but aside from that, they are indefensible, expensive to build and fabulously difficult to maintain. While realizing perfectly well that this does not apply to every part of the United States, it has been true for several thousand years that an unprotected masonry wall pushed up beyond the protective roof, is an invitation to trouble from water, ice, wind, and heat. Expansion and contraction under the action of the sun can produce spectacular but not pleasant results.

Low-pitched roof reaches up for clerestory lighting. Perkins & Will architects. Hedrich-Blessing photo.

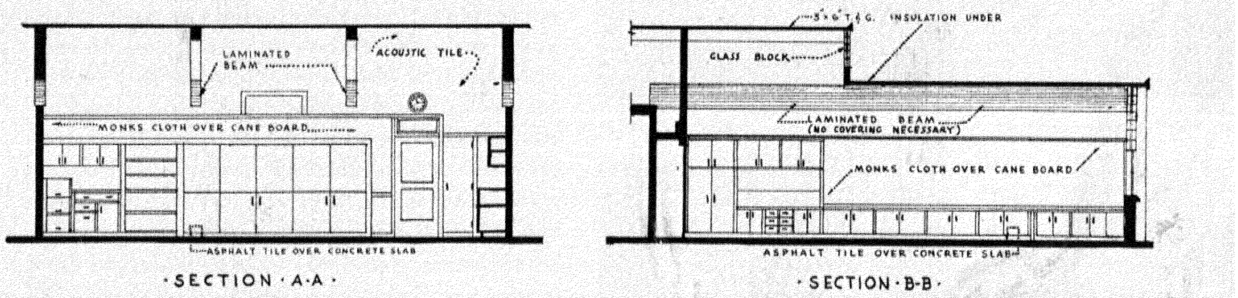




Roof overhang shades the windows, shelters the corridor, and is good design.

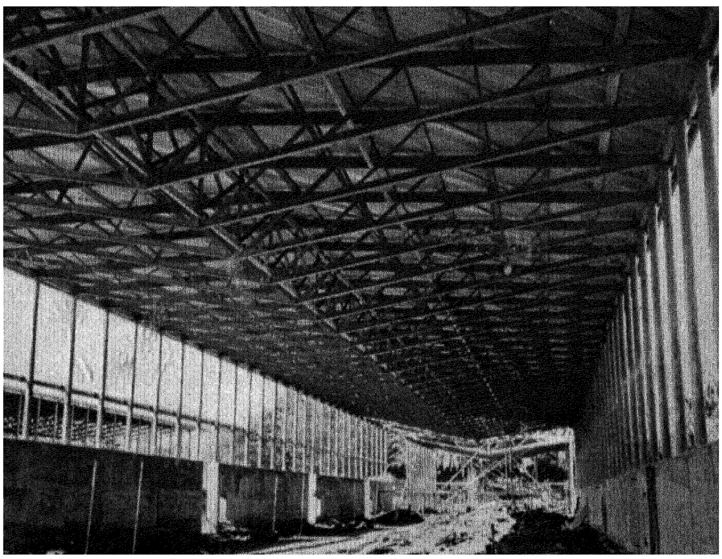


Ordered structure needs no decorative cover-up. Disco School. Eberle M. Smith Associates architects.



Structural materials require no covering when they are honestly used. Edmonds Schools, Edmonds, Wash. William Arild Johnson & Harold W. Hall architects.

Construction under way at La Canada School in California The unusual dihedral ceiling is, to quote the architect, H. L. Gogerty, "sloped in this manner to achieve the necessary depth of truss while preserving a flat roof appearance; to achieve a better 'child-scale' and to aid in deflecting the incoming light downward." Skeleton consists of light steel trusses 4'0" o.c. on 3½" pipe columns embedded in a concrete sill wall which is used to stiffen the columns and carry seismic loads to the footings.



This brings us to the whole case for overhangs in general. The Greeks and many before them, as well as many who have followed them, developed the cornice for the prosaic purpose of keeping water out of a masonry wall. An overhanging roof still serves that purpose, and if masonry is to be employed, particularly in the form of walls, this will continue to be a requirement as long as presently known materials are used in buildings. The overhang is also a vehicle for controlling sunlight, not to mention the time-honored architectural value of casting a generous shadow, but the problem of keeping water from going where you don't want it will be the thing which will preserve this detail of building.

As suggested earlier the list of possible roofing materials is too long to go into here, but we would like to report some successful roofs from the utility standpoint, which are also esthetically beautiful. On these roofs, white crushed rock in tar and gravel applications was used with the objectives of securing high reflectivity and of reducing the burden on the ventilation and cooling system below. On pitched roofs, natural nearly white asbestos shingles were used. These materials are easily maintained and have snap and freshness in design where roofs are visible and important. There is almost no part of the United States where resisting heat in the summer is not a more difficult roofing problem than the offsetting constructive value of absorbing heat with a dark roof in the winter time. Therefore, the priority usually goes to the summer effect in choice of roofing materials. We are earnestly looking forward to the time when sheet metal, particularly aluminum, becomes abundantly and economically available for building purposes.

To permit one sentimental digression, the principal value, it seems, in the pitched roof is not only as a sop to nostalgia but as a display place for beautiful materials. The case for a visible, double pitched roof deteriorates if an ordinary textureless, colorless material is employed.

Structural Materials

Every great style of architecture has become so by the exploitation and refinement of the members which were necessarily there. In short, the Greeks and Gothic architects exploited and rejoiced in the necessities of their building. We who call ourselves "modern" will succeed esthetically when we can translate our structural necessities and opportunities into the refined direct pattern of thought which they employed.

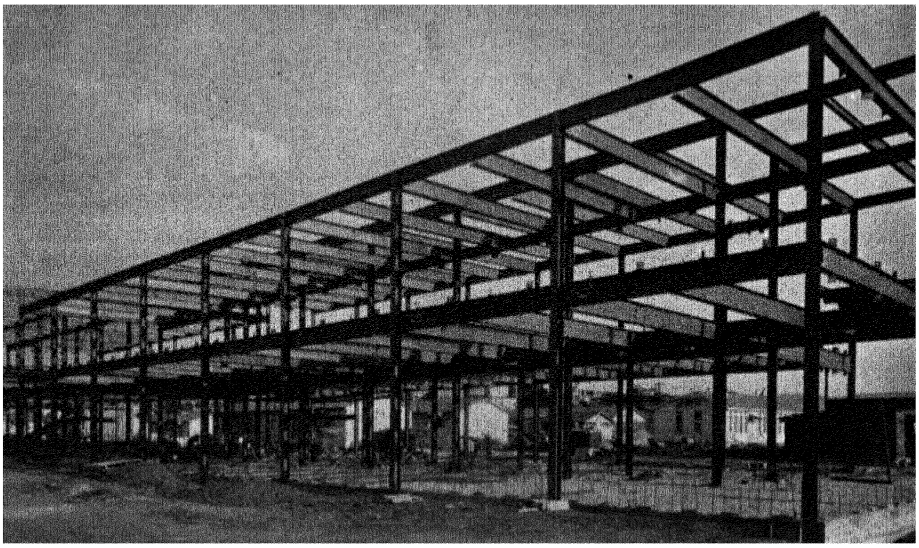
There is an important distinction to be made here. Their thought must be kept and kept alive. Their idiom must not limit us any more than it would them if they had our riches. This is a long and complicated way of saying that the structure of our buildings is going to show in spite of anything we do to put pants on it. Therefore, if it cannot be hidden, it must be designed. Much more than that, the structure is increasingly the design of buildings, and is emerging with more and more insistency from the chrysalis of traditional mannerism which we have hung around the live, growing organism which is the reality of the building itself. Everybody has had the experience of seeing the soaring beautiful skyscrapers thrusting their network and planes against the sky, only to have them degenerate into ordinary lumpish things as they were clothed in the cumbersome trappings of an architecture not their own. Fortunately, they were strong enough to carry even the burden of a misunderstood past in a misconceived present.

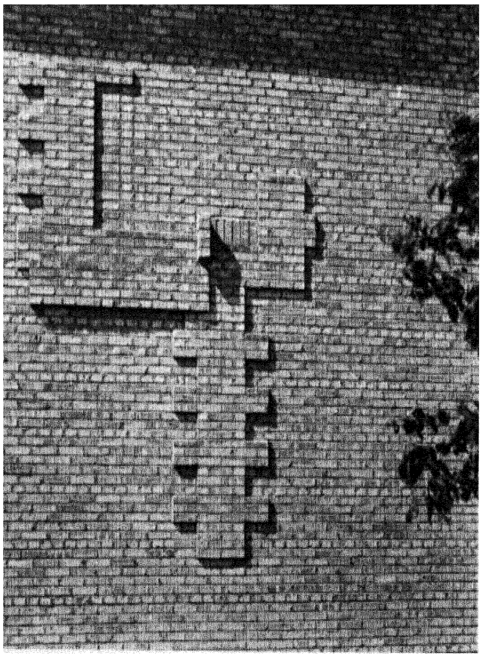
Most people have experienced the esthetic thrill of unadorned engineering structures such as the George Washington Bridge and the Hoover Dam. The good thing that the depression did to architecture was to relieve it of some of its cumbersome, useless burden and hasten the emergence of true building, true structure from its heavy envelope. From our financial poverty we gained architectural riches in the forced refinement of the structure that could no longer be expensively camouflaged. And what did we find? Apparently we found something that we liked better. Apparently we are destined to rejoice in the tailored simplicity that we found in poverty and hope to retain as we explore the fabulous choices that are available to us in a structural sense.

A reinforced concrete structure of columns, beams and slabs can be refined, satisfying and beautiful. So can steel. So can the structures of light metals. So can the very pipes and radiators of a building, so knowingly and intentionally used that they become elements in the esthetic effect of the building itself.

This whole book is not long enough to describe the uses of the materials which are available for school building structure. It can be pointed out, however, that reinforced concrete, which was unknown when traditional architecture was developed, has freed us from the limitations of span which governed room size and all of our concepts of proportion. Likewise it has freed us from the limitations of opening, which gave us our window size and proportion. Similarly, steel

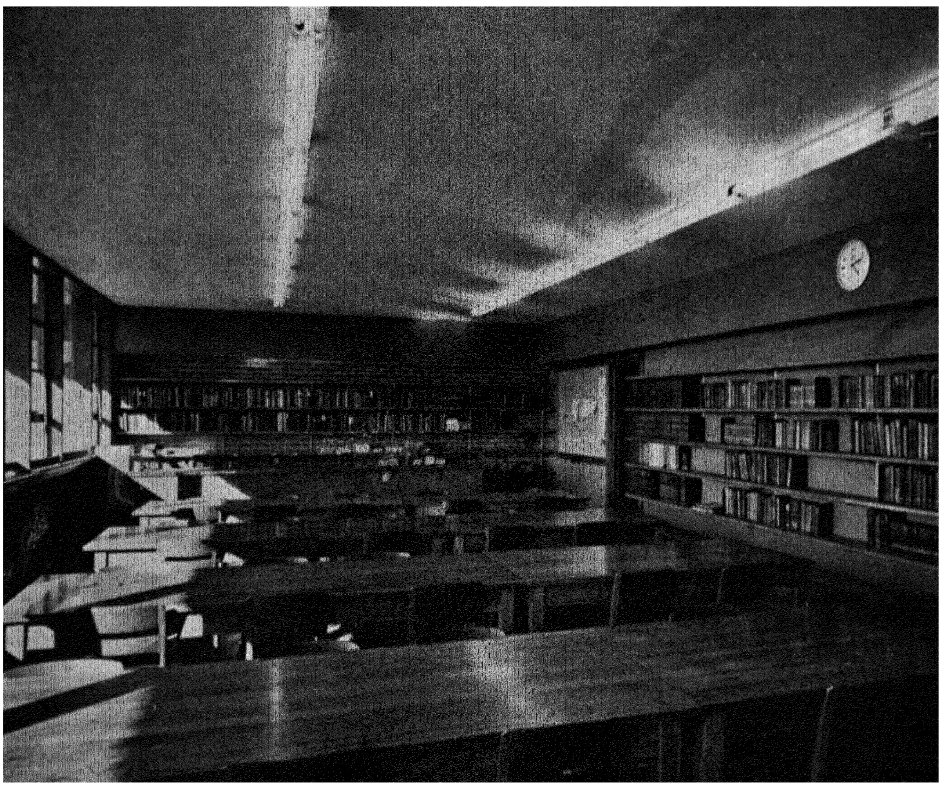
One of the first earthquake-proof, steel structures used in the Los Angeles schools. Ralph Waldo Emerson Junior High School, Los Angeles, Cal. Richard J. Neutra architect.





Decoration with simple materials. Eliel Saarinen, Eero Saarinen, Perkins, Wheeler & Will architects. Hedrich-Blessing photo.

Plain building brick forming the walls of this high school is invited in to create a warm and interesting, decorative pattern in the library. Grayslake High School, Grayslake, Ill. Ganster & Hennighausen architects. Snazelle photo.



in single pieces and in gossamer lacework has enabled buildings to step lightly and gracefully across formerly undreamed of spaces. All of this wealth of choice is available to schools and is used by them. But not enough. The classroom became the size we now know before reinforced concrete had really found its feet. The size of windows has been determined by wood and brick, not steel—and steel is here.

We add also that wood, brick, stone, terra cotta, and other materials with a long history, are still with us and are here to stay—for which we are grateful. But to translate the foregoing attitude back to them, let's again rejoice in the things we learn from poverty, and learn to design with the structure itself so ordered and so sensible, so mentally satisfying that it will be unnecessary to cover it with camouflaged surfaces. Wood beamed ceilings can be a delightfully designed element in a lighting system. Wood truss roofs can be part of the architecture as well as the structure of a playroom or assembly hall. Yes, even 2 x 4's and brick piers can be so cleanly and deftly employed that covering them up would be an esthetic loss. Not that we have anything against plasterers personally.

And most important of all, when each of these materials is used knowingly with attention to detail, with a real sensitivity to the liveness of structure, an esthetic grace is found that approaches the clarity and grace of the more purely mathematical engineering structures. We predict hopefully a further trend in this direction.

Decoration

Decoration is not a subject apart from design. We just got through saying that the bones of a building should be ordered and beautiful. To carry on the same thought, the "decoration" should actually be the completion and continuation of the job of enclosing pleasant, usable space in ordered simplicity. We are not going to go into any discussion of reflectance factors, pastel shades, bright colors or color harmonies in this book. All we can do is suggest an attitude and some things not to do.

The vehicles for decoration are paint, plaster, cloth and the materials of structure itself. The more these latter are left in their natural, unadorned state, the more nearly maintainable a building will be. This book abounds with illustrations of natural brick, natural wood, the new plastics, unpainted acoustical material, all used as their most direct, unadorned selves. It is necessary to go beyond this in some cases in the utilitarian way as a preservative and to create environment for seeing and esthetic conditions.

Paint to achieve light distribution in a room and produce proper and necessary reflective surfaces is as legitimate a part of the functional design of a building as the glass in the windows. Paint to take perfectly honest, straightforward materials and make them seem like something which they are not, is less commendable. Bright colored paint used as seasoning to lend zest and sparkle by small vigorous color accents is delightful and could probably be defended as function.

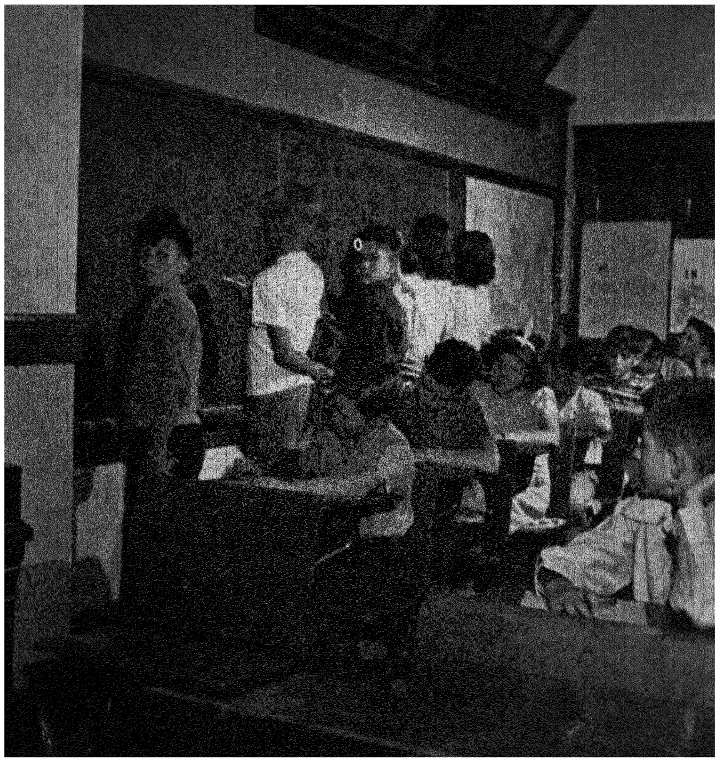
But in the decoration of school buildings remember three things: (1) Children are colorful and are themselves the ornament of an otherwise simple, unadorned room; (2) Whatever you do to start with will sooner or later be corrupted. So don't pin your whole design faith to a color scheme. Finally, don't decorate for the exclusive pleasure of the maintenance man. America has been swept by a spectrum of colors ranging from light brown to dark brown in the hope that the evils of dirt could be obviated by imitating dirt. Use color. Use color carefully to conserve good seeing. Use color fitted to the lighting, the size, the job, the atmosphere of the space and the activities in it. Use light colors to spread the area of light and cheerfulness in usable space throughout a building. Use bright colors to liven and punch home the concept of a school as a cheerful, constructive place.

Wood and brick in nearly natural state are pleasant as well as easily maintained. Perkins & Will architects. Hedrich-Blessing photo.

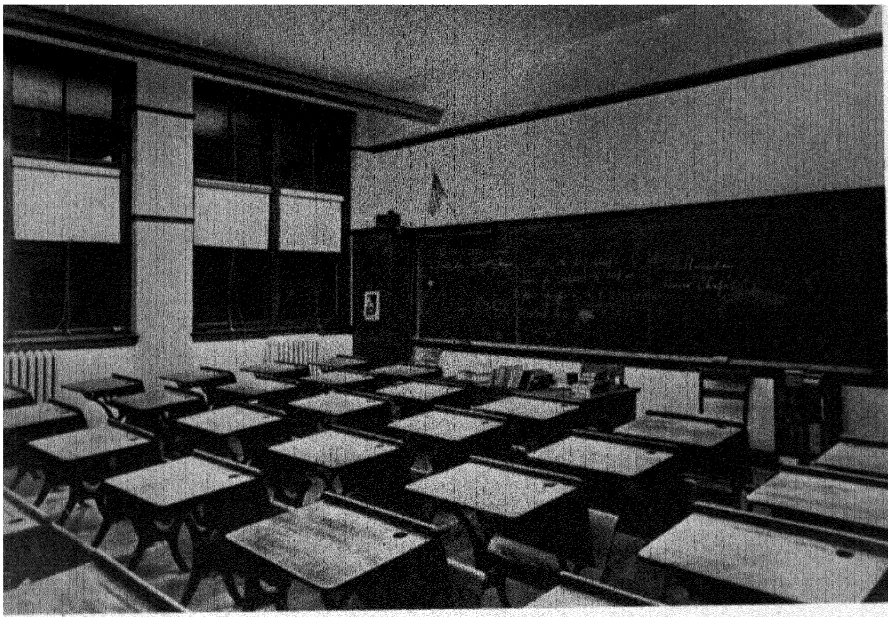
CHAPTER 9: Equipment for the Schools

One part of the school plant which needs to be talked about is the equipment. Not only is equipment of various kinds necessary for the plant to function but it has much to do with the uses to which the plant can be put. Now in this machine age, almost every job can be done better if a carefully selected kit of tools is available. An educational job is no exception. To plan a new plant properly, therefore, one has to know what is going to be in the educational kit of tools which will be available so as to plan spaces designed for the use of such tools. Some of the educational tools may require definite amounts of space, some special acoustical treatment, others special types of floors, special lighting conditions may be needed, special storage facilities may be necessary. If such information is not available, the same dread results may occur as would happen if a building were planned to house a block of humming birds only to discover that the actual occupants were sea lions.

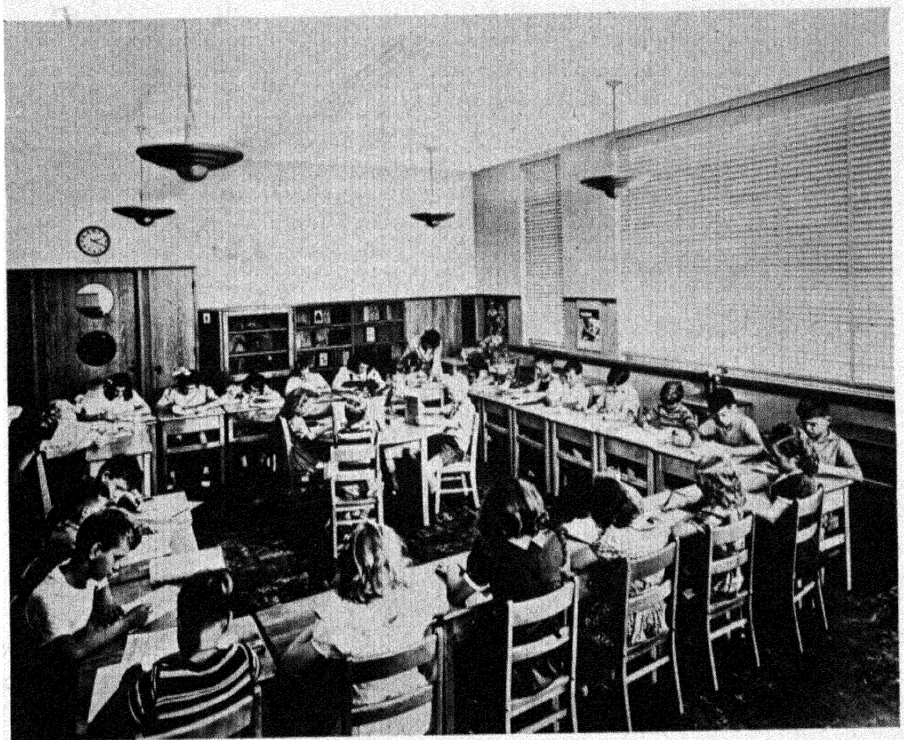
A modern educational program requires a large amount of equipment and also a vast variety. Once again the situation today is greatly different from that of former times. In years gone by not much equipment was needed, and what there was of it was simple and relatively unimportant. In the main it consisted of pupils' desks screwed to the floor in five rows of seven to a row per room, a teacher's crude desk and chair, a box of maps hung over the front blackboard, and a row of hooks for wraps. Sometimes there was a bookcase, sometimes a row of open shelves. Not much else was needed when the chief educational purpose was to assign so many pages out of one textbook for all the pupils to learn, and to hold a recitation period where the pupils were given an opportunity to demonstrate to the teacher how well they had learned it. The janitorial equipment was equally simple; one broom was all that was required. Before school began in the fall, the school "director" and his family took a day off and mowed the weeds on the school yard, scrubbed the floor and windows, and sometimes replaced the window lights. The assumption was that like the Saturday night bath, one good cleaning a year was all that was necessary.



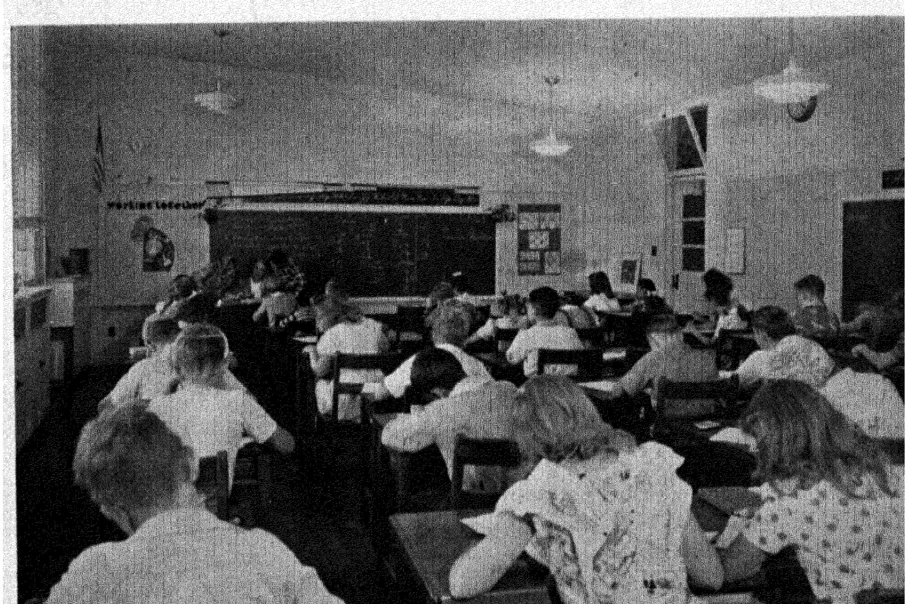
Fixed, uncomfortable seats of various descriptions, dark chalkboards, and a "box" of maps constituted the major equipment in the school buildings of a few years ago. Many rooms today still have this type of equipment. Esther Bubley photo.



In this classroom old times and unsatisfactory equipment are found even though an attempt has been made to "modernize" the electric lighting. Edwin F. Guth photo.



Here we have equipment found in modern classrooms, tables and chairs of different sizes and shapes, venetian blinds, bookcases, and a sink. Courtesy of Gypsum Association.



Here again we have a classroom which is equipped with comfortable seating, and which is adjustable to a varied educational program. San Diego City Schools photo.

But conditions have changed. The once simple program has become widespread and complex. Hearing recitations has given way to emphasis on doing things as the best way to learn. Many services such as health examinations, cafeterias, libraries, audio-visual activities are accepted practice. Technology has given us gadgets and devices of all sorts and kinds. The equipment necessary in a school where such conditions prevail is large in amount and of many different types. In planning a new school plant, provision has to be made for what is necessary.

The equipment pictures here meets most of the criteria for good seating. It is found in the Hessian Hills School, William Lescaze architect.

Seating

Let's look for a moment at the requirements for seating in a modern school building. *It should be movable.* The auditorium is an exception, but even in this space when a level floor is used and it is necessary to use it for a variety of purposes, movable seating is required. It is safe to say that for all other spaces, movable seating is essential. Of course there are various ways of accomplishing this purpose. Manufacturers have produced a complete single unit with seat and desk in one place. These can be arranged in any formation desired. They have the advantage that the seat and working surface go along together. They have the disadvantage of being clumsy and difficult to move and store. Tables and chairs entirely separate from one another are receiving more and more favorable reception. Tables are built for one, two, four, or six persons, and may be placed together to accommodate any number desired. Tables and chairs seem to be suitable for any type of person from the youngest nursery school babe to the oldest graybeard. It is our guess that here we have the type of seating which will become normal practice.

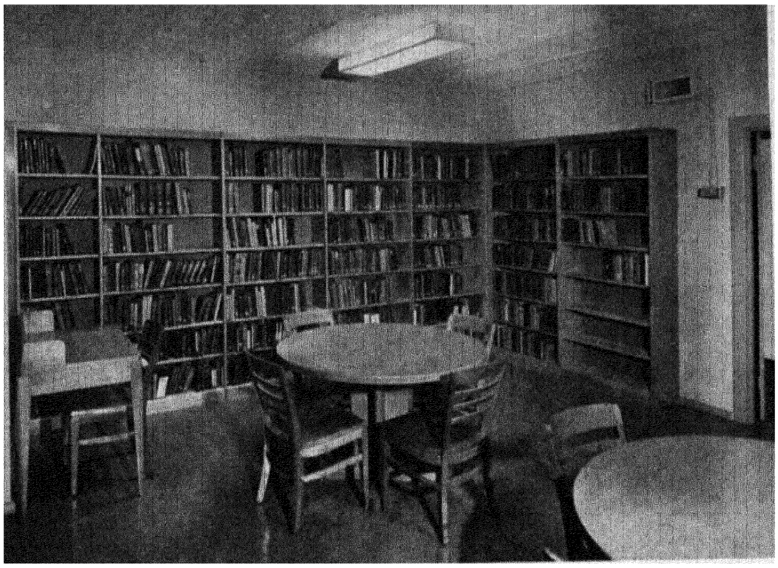
It should be light in weight. If seating is to be moved into different positions, it will have to be done by the pupils most of the time. So it must be light enough in weight in order that they can do it; that is, pick it up and put it down again. It is just as bad to slide furniture over the floors of a school as in Mama's living room at home.

It should be sturdy. Furniture that is moved must be built to withstand it. So the secret is to combine lightness with sturdiness in the selection of materials. Concrete benches are sturdy but not light, so they won't do. Aluminum and plastics may provide some of the answers. Research and experimentation are needed. The final answer has not been given.

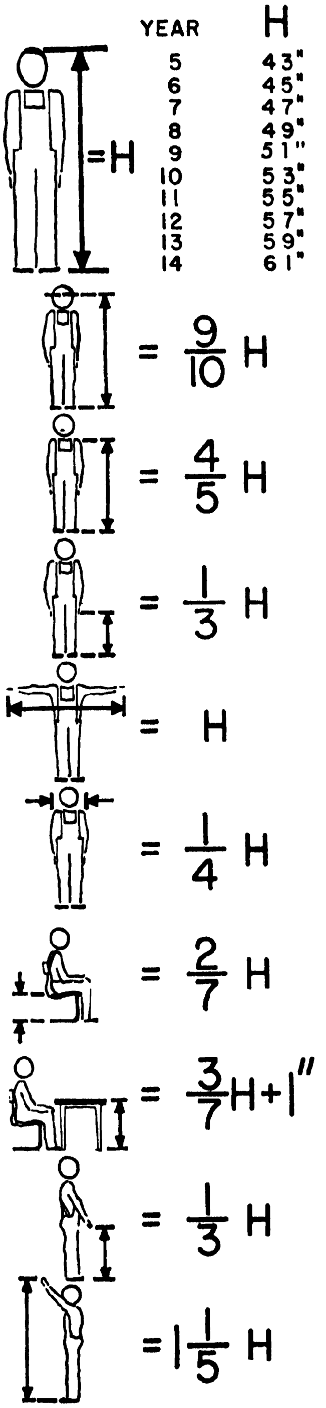
It should be stackable. A particular space

Here we have another example of good seating equipment for classrooms. This seating can be used for many purposes and in many ways. Perkins & Will architects. Hedrich-Blessing photo.

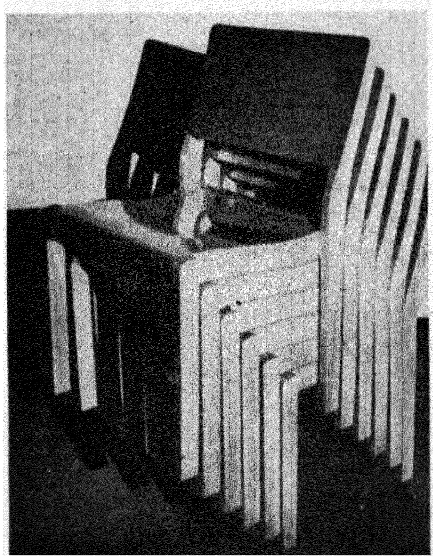
Another example of good seating for classrooms, libraries, and other spaces for individual and group work. Cavalier Pictures photo.



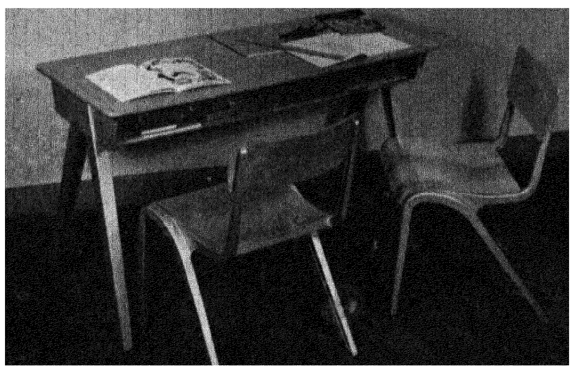
Professor W. W. Caudill presented this averaging of child stature relations to help guarantee furniture and equipment that is child-scaled and fits the user. *Space for Teaching* by W. W. Caudill.



Meets the requirements for good seating. It is durable, adaptable, comfortable. Howard Berry photo.



Seating can be stacked. It needs to be if children and adults are to use the same space. It facilitates cleaning. It makes sense. Alvar Aalto designer. Courtesy Museum of Modern Art.



A light weight desk and chair which is most practical for all kinds of classroom use. Manufactured by Colen Warrick of England and designed by James Leonard. Introduced in this country by Knoll Associates, Inc.

may be used by people of quite different ages, and for quite different purposes. The same space may be used by children from six to eight years during the daytime and by their papas and mamas in the evening. Or a class in modern history may use the space part of the day and an art group other periods. In any case, the same seating and working surfaces will not fit the needs of the various groups. So it must be possible to stack and store one set of furniture while using another set. Furniture should be designed, therefore, so that it is stackable. The Texas Agricultural and Mechanical Arts College, among others, has experimented with this idea and has produced some results which work. We need more such studies.

It should fit the user and be comfortable. It took us a long time to realize that seating has a lot to do with the ability to learn. A person with a toothache or whose shoes hurt his feet does not perform any job very well. He has other things on his mind and his disposition is not a joy to behold. The same thing occurs when a pupil at school has a seat which is uncomfortable and does not fit his particular shape and size. While there are a number of kinds of seats which can be adjusted mechanically to fit various shapes, the chances are they won't get adjusted often. And anyway if various people use the same seat, a man with a wrench would become a permanent part of the scenery. Far better in our judgment is to have two or three different sizes of seats and tables in the same room. Chances are that the user and the seat adapted for him will get together. We know for sure that adults will not come back many times to a room seated with furniture for very small children. Who wants to go to a school to be uncomfortable? It makes sense then to provide seating suitable to the user. Where adults and children use the same space, a change of seating is required.

It should promote health and good posture. There are a few simple rules regarding seating which if followed rather faithfully will aid a lot in developing good health habits. The seating should make it possible for the person using it:

(1) to rest his feet flat on the floor
(2) to distribute his weight over the whole seat area
(3) to have the back of the seat support only the hollow of the back
(4) to have clearance between the front edge of the seat and inside angle of the knees

For further information on this subject, the reader is referred to the 1949 Yearbook of the American Association of School Administrators entitled, "American School Buildings," Chapter 14.

It should be finished so as to avoid glare and to reflect light. Furniture in a room has a lot to do with proper lighting and hence with good seeing conditions. Dark brown furniture so frequently found in schools absorbs light. As good seeing conditions depend so largely on reflected light, it is essential that the furniture aid rather than hinder. Light blond finishes have a large reflective value and should be used in all schoolrooms. Again, all furniture should have a dull finish to avoid glare. The highly polished jobs which may look good in a display window are about the best glare producers imaginable. Avoid them.

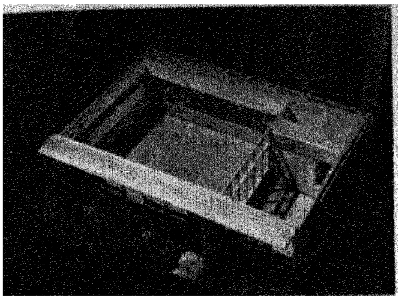
Finally there is a place in schools for some informal types of seating such as is found in the average living room. Library reading rooms, teachers' rooms, student lounging rooms, might well have some upholstered, easy furniture. Children of all ages like to get down on the floor to read and to do lots of other things. Small rugs in front of the fireplace or in a nook help a lot. Incidentally, they help to take away the institutional look so common to most schoolrooms. Try them.

General Classroom Equipment

A modern classroom needs a considerable number of other articles in addition to good seating. In rooms for little folks, there should be cots, sand tables, a movable "truck," blocks and other construction materials. Older children, youth, and adults also need sand tables.

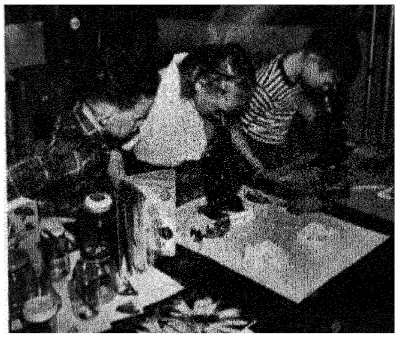
A work bench is a necessity. Every room should have a sink with running water for most activities in this day and age. Then, there must be facilities for filing things. Not just one type or size of filing equipment but several types for various purposes and of different sizes and shapes. Preferably these boxes and cases should be built to suit the needs anticipated for them. Caution: they should not be built into the walls. Make it possible to move them about and serve as partitions to divide the room. Of course, they should be module units which will fit the room in which they will be used. Those who know teachers and children and their needs, can appreciate that it is almost impossible to have too much equipment of this sort. Then there must be bookcases with or without doors. Again, these should be movable and hence sturdy in construction. A word about the desk or work space for the teacher. Few have given any thought to designing a desk which a teacher really needs. Some of its characteristics are: (a) a flat top of consider-

Here we have a model of a modern classroom. Query—what kinds of equipment belong in such a room? Perkins & Will architects. Hedrich-Blessing photo.

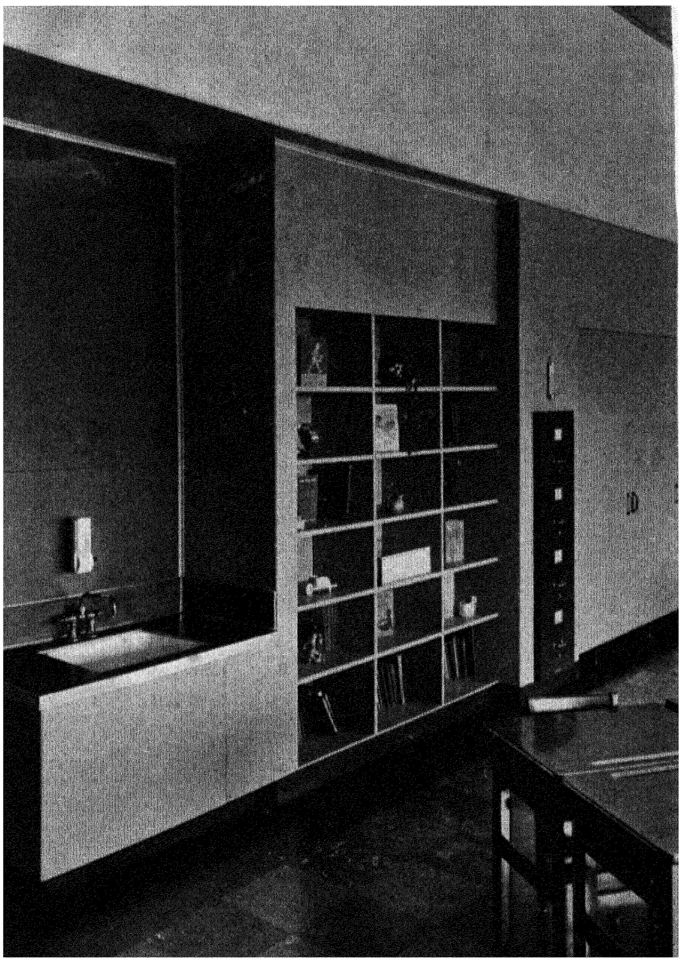


A modern school program requires lots of equipment and materials. Do you want facilities like these in your school? Courtesy New York City Schools.

We live in an age of science. Our schools must be equipped so that pupils can study science as it relates to everyday life. Public Schools, Madison, Wis.

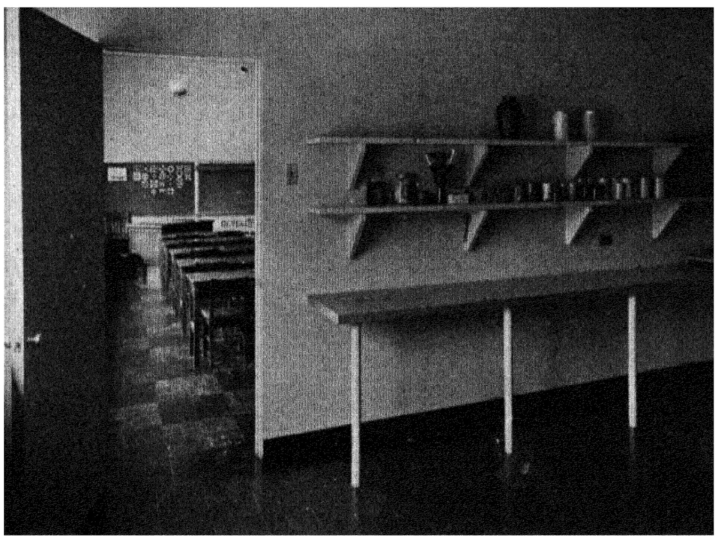


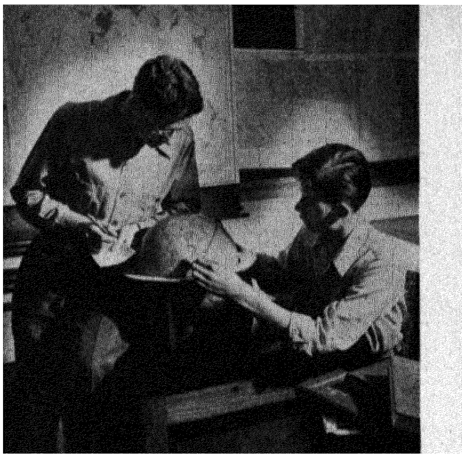
Pupils need places to put things. Storage closets, open shelves, filing cabinets all help. A sink in every classroom is now a necessity. Samuel H. Gottscho photo.



Learning to live in today's world requires equipment used in the world today.

A combination workroom and storage room in connection with a classroom makes a desirable suite, particularly so if the space is equipped as shown in the illustration below. New Fairfield School, Conn. Courtesy United States Office of Education. Samuel H. Gottscho photo.

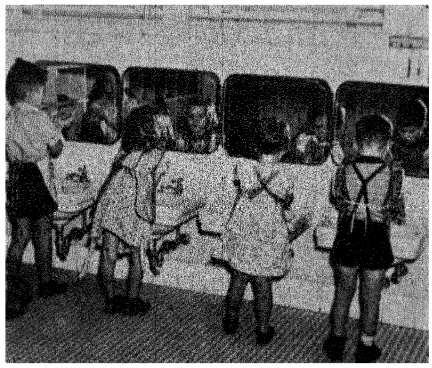


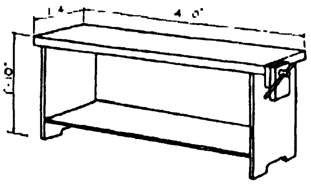


Maps and globes are essential equipment if one is to understand the "One World" in which we live. Courtesy of the Madison, Wis. Public Schools.

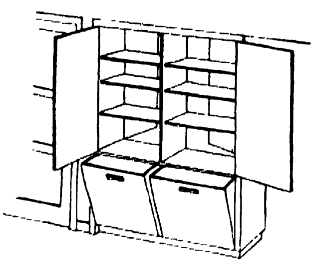
Today's school program includes home and family relationships. The proper care of the young child is emphasized. Here again necessary equipment plays an important role. Courtesy United States Office of Education.

Well-equipped washrooms are a "must". Kenneth Kay photo.

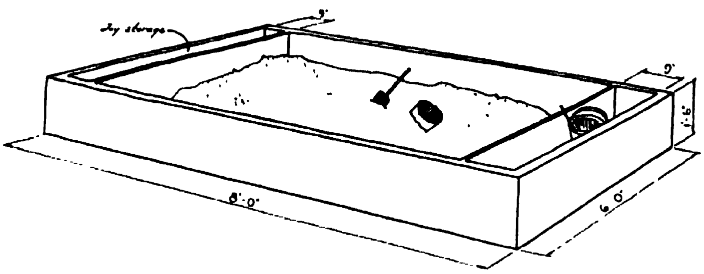




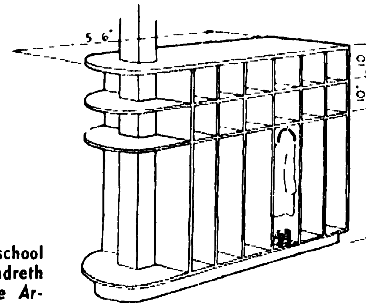
Carpentry Bench



Staff Storage Cupboard

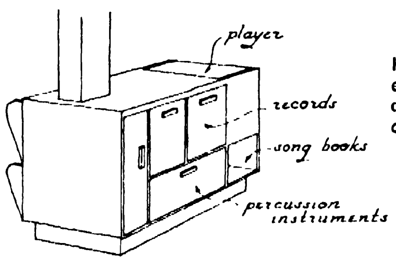


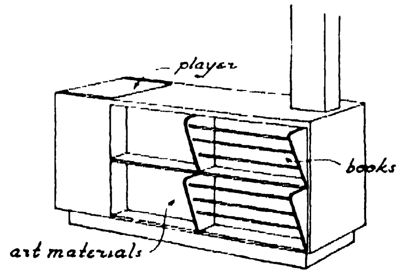
Sandbox



Locker projection

Here are some ideas for good nursery school equipment as suggested by Catherine Landreth and Howard Moise. Courtesy *Progressive Architecture.*





Book and Record Cabinet

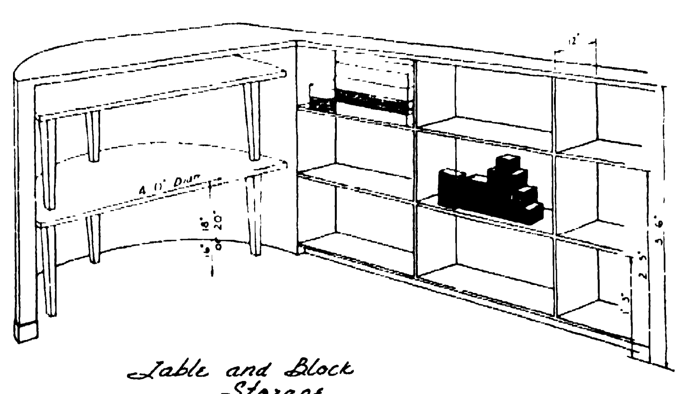
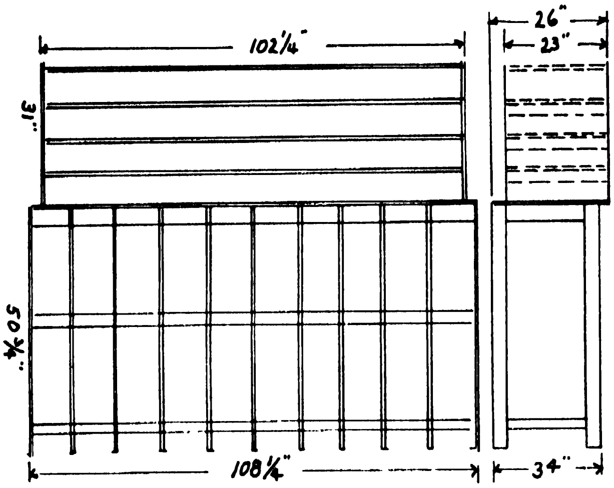
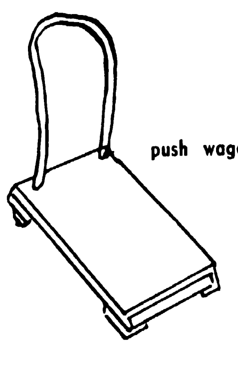


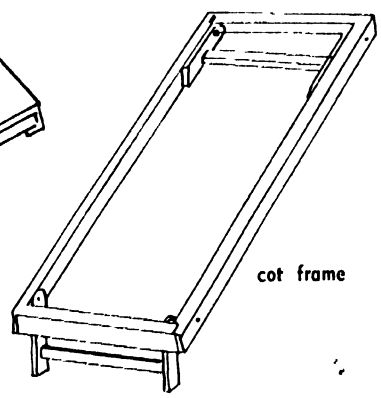
Table and Block Storage



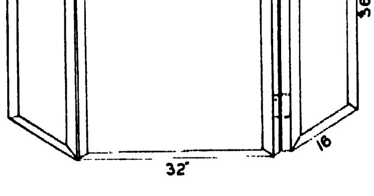
Cot and bedding rack (carpenter-made). Pine wood boards approximately ¾" thick and 3" wide. Wider boards may be used to advantage. Courtesy *The American School and University*.

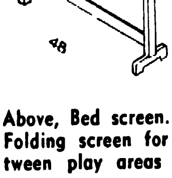


push wagon

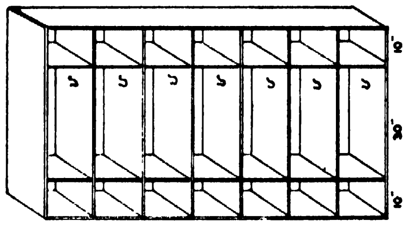


cot frame

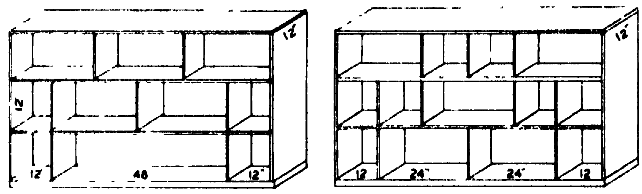




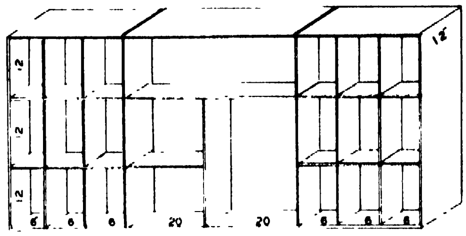
Above, Bed screen. At left, Folding screen for use between play areas or cots.



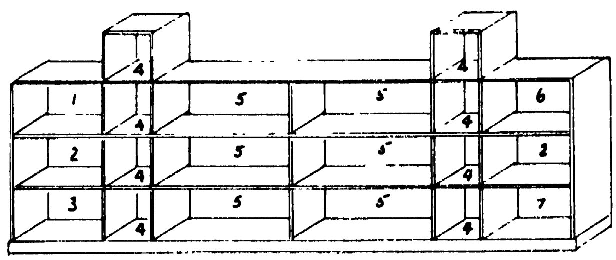
Individual lockers with hooks on each side and at back.



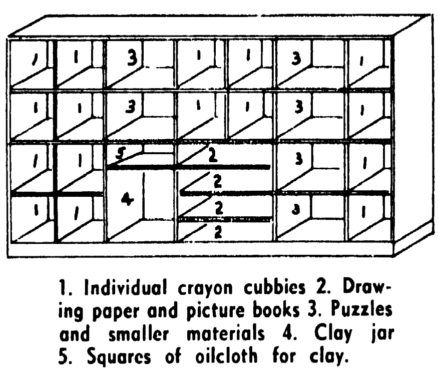
Lockers for blocks and supplementary materials.



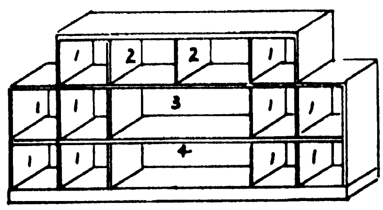
Individual cubbyholes for creative art supplies.



1. Toy animals 2. Boxes filled with colored cubes 3. Toy automobiles 4. Small size blocks 5. Solid blocks 6. Dolls 7. Curved blocks.



1. Individual crayon cubbies 2. Drawing paper and picture books 3. Puzzles and smaller materials 4. Clay jar 5. Squares of oilcloth for clay.



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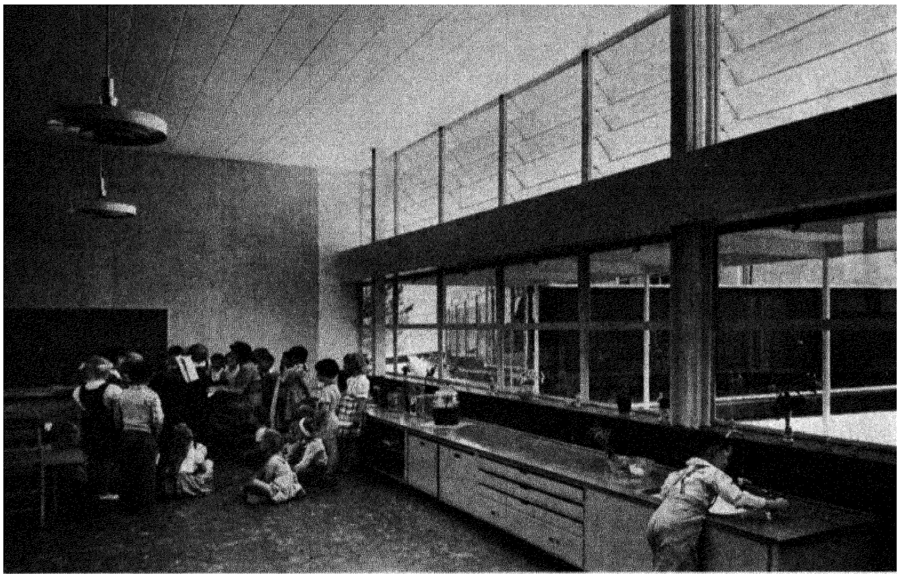
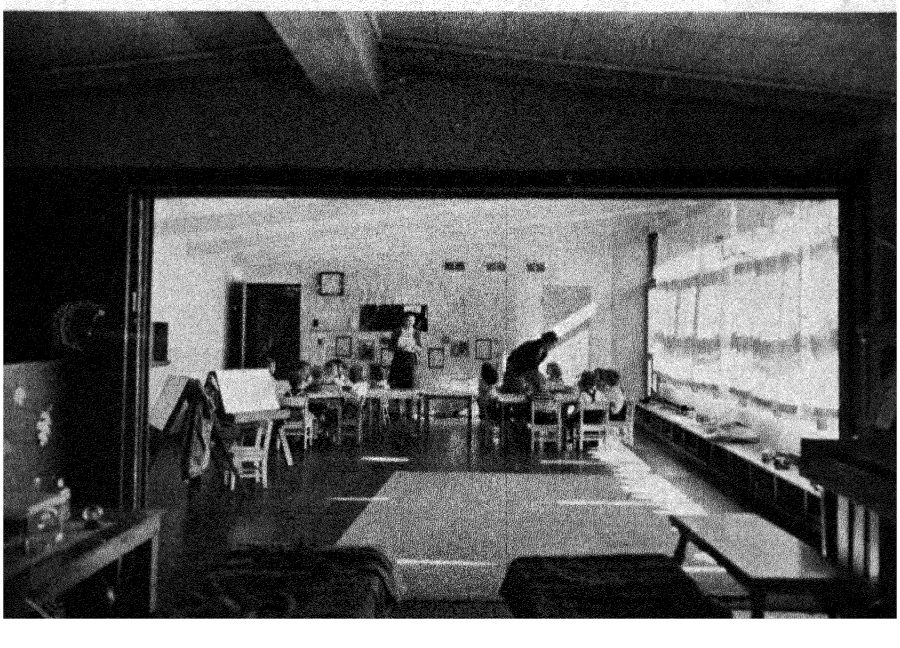
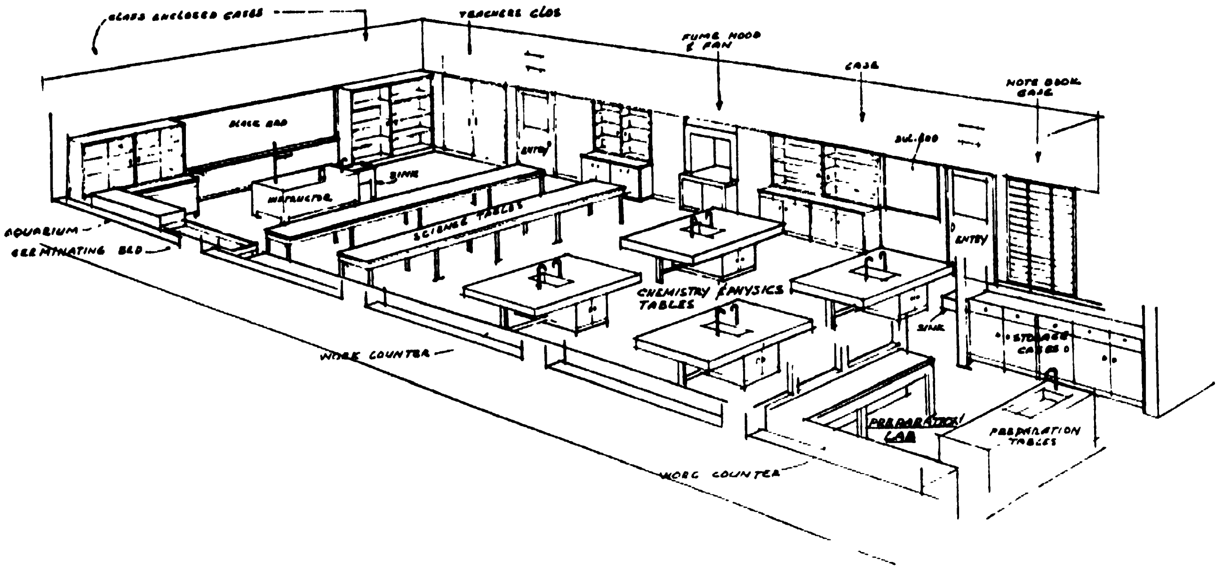


Cabinets tailored to fit a given space are economical of floor area and can be designed to serve various needs. School at Fairfax, Cal. Bamberger & Reid architects. Roger Sturtevant photo.

Delightful space showing various kinds of useful equipment for young children. Wouldn't you like to have your child in such an environment? Palmer School at Colorado Springs. Edward L. Bunts architect.



Another example of a well-equipped classroom. "It takes a lot of living to make a home" especially when it is your school home. Harris Armstrong Community School. Piaget photo.

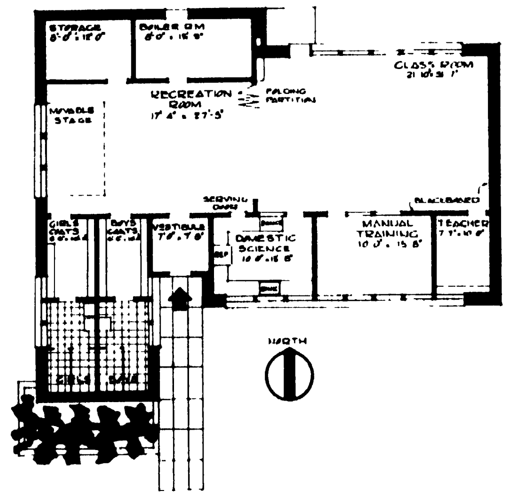


able size where the teacher and one or more pupils may work together; (b) plenty of different kinds of filing and storage space; (c) open on both sides so that two or more persons can work across from one another; and (d) legs of the desk out of the way as much as possible and of such shape and texture that they will not ruin every pair of nylons which comes near them. And, oh yes, a chair for the teacher that is really comfortable—few are.

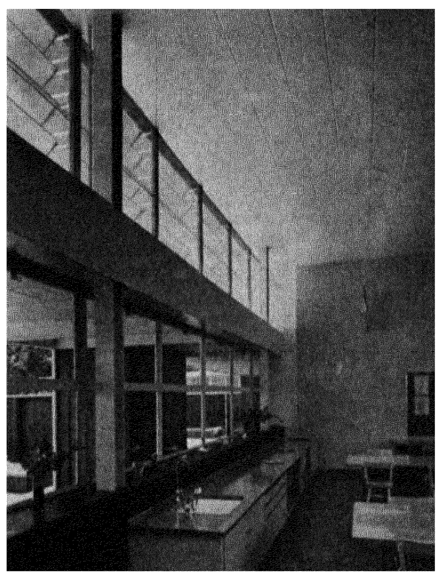
Modern secondary schools are devoting increasing attention to sciences. One of the interesting developments is designing space in which several phases of sciences can be studied. Such space has to be equipped so that the purposes can be achieved. Eberle M. Smith Associates architects. Courtesy *American School and University.*

Shop and Laboratory Equipment

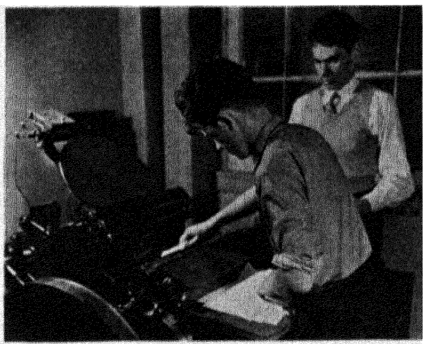
With the exception of the technical and trade schools, the trend in shops and laboratories is away from rooms filled with fixed machines and unit laboratory tables, and toward as much open space as possible. The emphasis is on space in which to work, not at just one thing but at several and by different groups. This trend requires a considerable change in equipment. Much more is needed because (a) many more kinds are available and with which students should have experience, and (b) many different kinds of activity go on in a given room. The aim is to keep the central portion of the space as clear as possible so that it may be used by groups for a variety of purposes. As much of the equipment as possible should be movable and should be placed around the perimeter of the room. This is especially true of equipment requiring water, gas, electricity. Storage and filing space should be in abundance and this too should be of various shapes and sizes, and movable. Individual locker or storage space in which pupils may store the materials on which they are working is very successful, and is a must when several groups use the same space. A shop or laboratory should look like one, and that is true of its equipment.



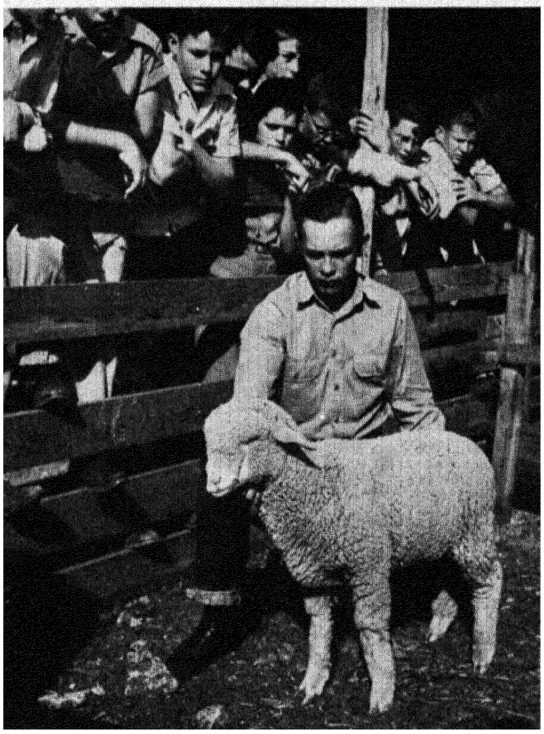
The floor plan of the Nichol Township School illustrates that even in the very small school emphasis has been given to providing a considerable percentage of the total area for shop and laboratory purposes. John B. Parkin Associates, Toronto, Canada, architects.



Every room in a school building is a shop or a laboratory. It should have the equipment needed to do the work which will be carried on in it. Here is shown some of the equipment which every elementary classroom needs. Fairfax School in Cal. Bamberger & Reid architects. Roger Sturtevant photo.

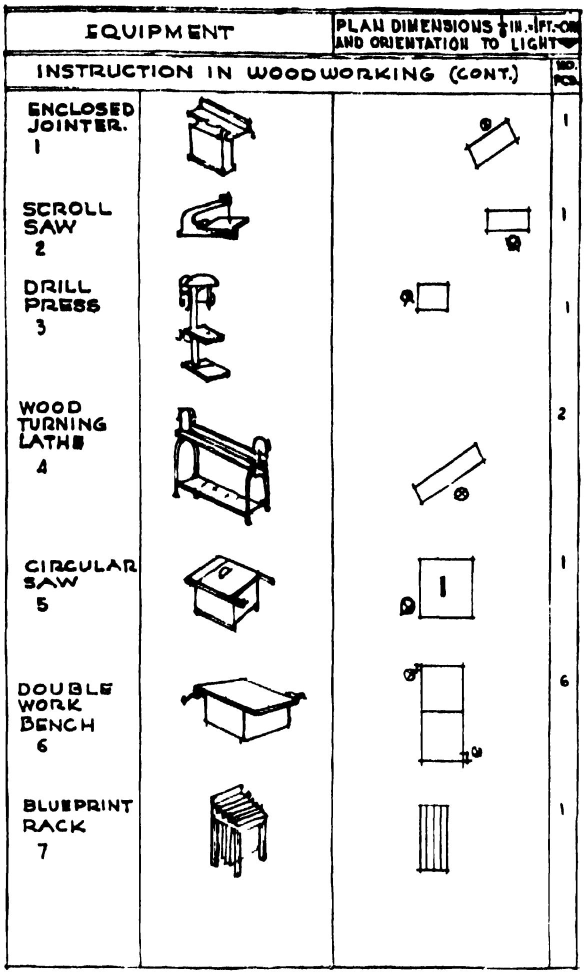


A modern program provides for many kinds of shop experience. Printing finds an important place and good equipment is necessary for it. Junior high school print shop in New York City.



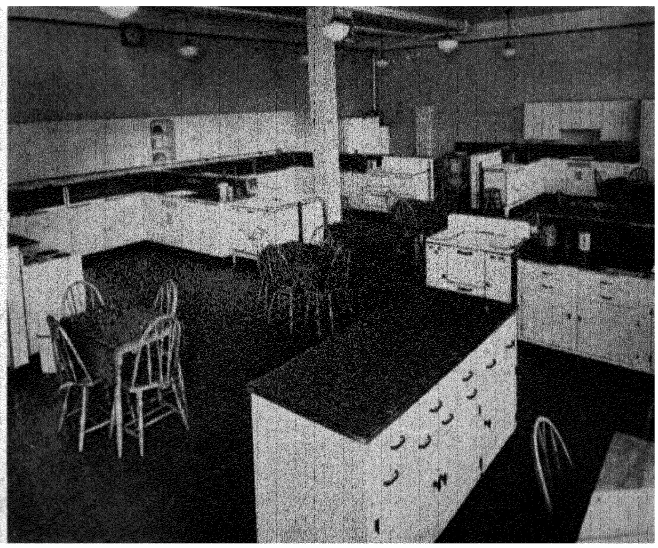
Agricultural shops have an important place especially in our rural communities. Some shops are inside buildings and some are in the out-of-doors.

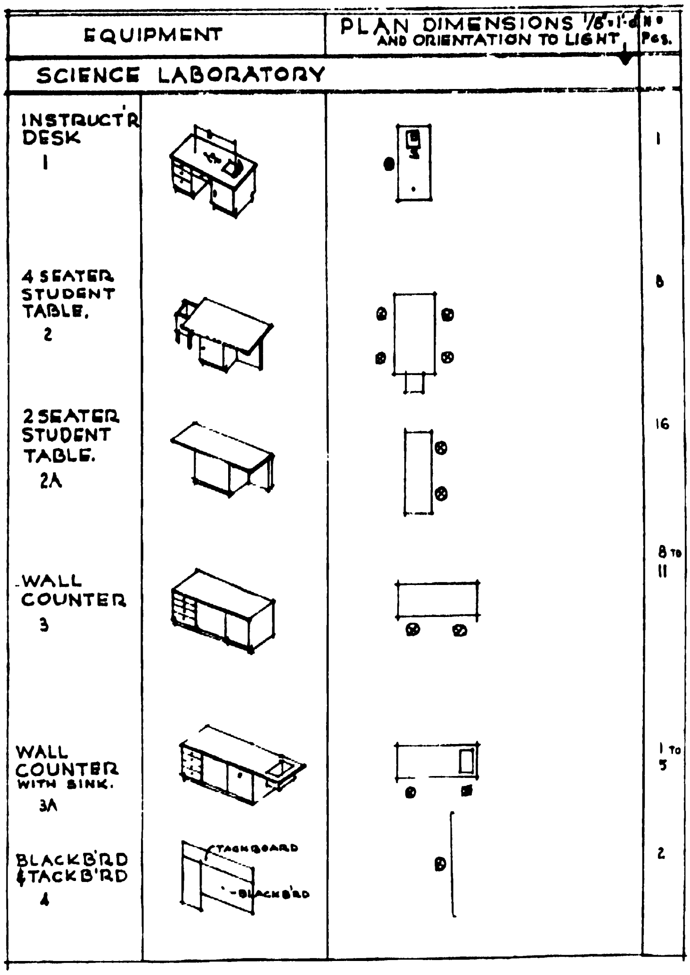
The industrial arts shop is the center for a vast number of activities. Illustrated here are some of the equipment which every such shop should have. Urban Schools for Puerto Rico. Richard J. Neutra architect.



EQUIPMENT		PLAN DIMENSIONS IN.-FT.-ON AND ORIENTATION TO LIGHT	NO. PCS.
INSTRUCTION IN WOODWORKING (CONT.)			
ENCLOSED JOINTER. 1			1
SCROLL SAW 2			1
DRILL PRESS 3			1
WOOD TURNING LATHE 4			2
CIRCULAR SAW 5			1
DOUBLE WORK BENCH 6			6
BLUEPRINT RACK 7			1

Every girl and many boys need to learn about many phases of homemaking. This large kitchen (right) is an important part of a homemaking laboratory. This small, homey kitchen (left) is family size and is typical of thousands in homes across the country. Courtesy United States Office of Education.

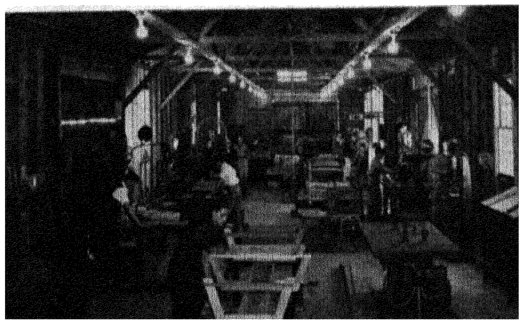




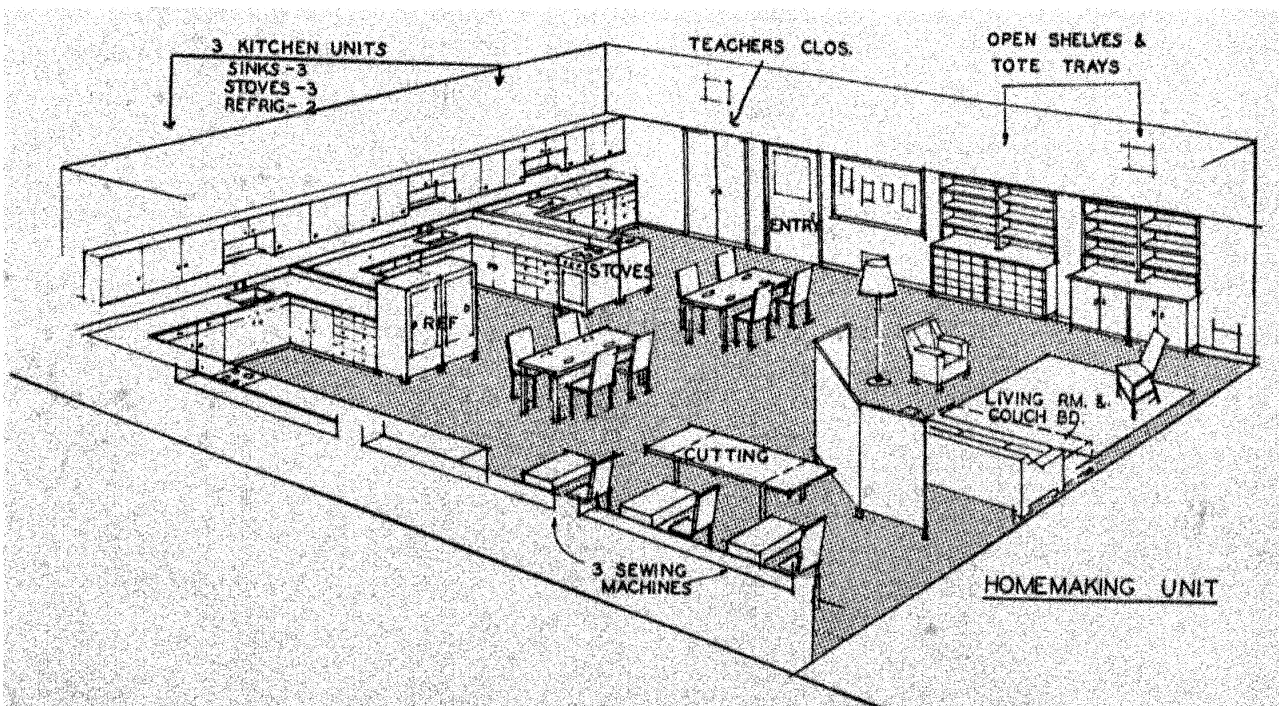
EQUIPMENT		PLAN DIMENSIONS 1/8"=1'-0" AND ORIENTATION TO LIGHT	No Pcs.
SCIENCE LABORATORY			
INSTRUCT'R DESK 1			1
4 SEATER STUDENT TABLE. 2			8
2 SEATER STUDENT TABLE. 2A			16
WALL COUNTER 3			8 TO 11
WALL COUNTER WITH SINK. 3A			1 TO 5
BLACKB'RD & TACKB'RD 4	TACKBOARD BLACKB'RD		2

These boys are preparing for jobs in the planing mills, furniture factories, and similar occupational pursuits in and around San Antonio They find a ready market for their services. Mill Work and Cabinet Shop, Sidney Lanier Vocational High School, San Antonio, Tex.

In large comprehensive and technical high schools, specialized shops are found. Above is pictured a woodwork and carpentry shop. Many different kinds of equipment are needed if it is to function satisfactorily.

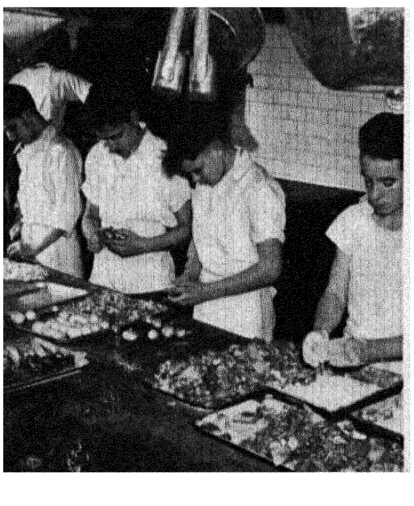


In many of our smaller schools one room houses all of the homemaking program. In such cases, a variety of equipment has to be provided. Eberle M. Smith Associates architects. Courtesy *American School and University*.



A well-equipped lunchroom is an important part of today's school. Courtesy of the Birmingham Public Schools.

The New Canaan, Conn. Elementary School has been planned so as to provide ample lunchroom facilities for pupils. These same facilities can also be used for various community functions. Below: Well-equipped lunchrooms expedite serving. Courtesy New York City Board of Education.



Lunchroom Equipment

A school lunchroom has two major divisions: (a) the kitchen and related spaces, and (b) the dining room. It is good business to equip these spaces with the most modern and labor-saving devices. The kitchen requirements include large cooking stoves including ample space and a hood to carry off the smoke and gases, a walk-in refrigerator plus a large regular refrigerator, a dishwasher, plenty of cupboard space, tables, meat blocks, electric mixers, storage cabinets, in addition to the usual kitchen and cooking utensils. The center of the kitchen should be free from fixed equipment. Proper arrangement of equipment based upon the priority of procedures greatly aids the efficiency of the workers.

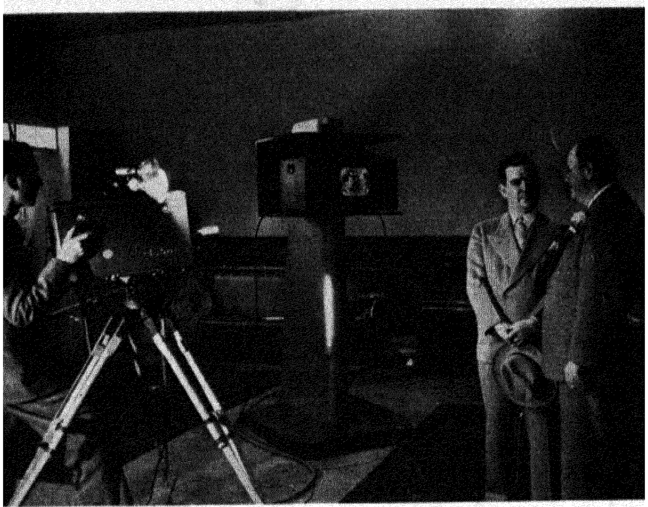
The dining room equipment begins with the steam table and serving counter which should be placed, of course, in proximity to the kitchen. Tables seating six to eight persons provide the best arrangement for eating. In lunchrooms serving people of a considerable age range, tables should be of several heights with chairs to match. Chairs should be comfortable. The principles set forth for seating in the earlier part of this chapter apply here. Storage space in the dining room should be provided in case this room is to serve other purposes. One final suggestion. Don't clutter up the dining room with furniture and equipment not absolutely necessary.

Audio-Visual Equipment

Here is a tough one. The whole conception of audio-visual aids in schools is in a state of flux, and the number of such aids is constantly increasing. We shall touch upon four phases of equipment for this purpose: (a) machines, (b) screens, (c) storage, and (d) other visual aids. Millgate and Coelln suggest that mechanical equipment for audio-visual purposes should meet the following specifications: (1) require a minimum of handling, (2) require a minimum of teacher manual dexterity, and (3) fit in with other educational processes.* The machines which should be commonly found in a school are a 16mm projector, at least one for each wing or floor of the building, and one for exclusive use in the auditorium; opaque projectors, lantern slide projectors, slide film projectors, transcription machines, and radios and microphones. Millgate and Coelln urge the use of machine carts

* I. H. Millgate and O. H. Coelln, Jr., *Standards for Visual and Auditory Facilities in New Educational Buildings*, The American School and University, *Vol. XVIII, p. 136, 1949, American School Publishing Corporation, New York.*

Radio is essential equipment for a modern school.



Television, too, has a part to play, a part which will become more and more important. Courtesy of R. C. A. Victor, Camden, N. J.

The sound motion picture is being increasingly used as an important aid in our schools. Courtesy of the Bell and Howell Company.

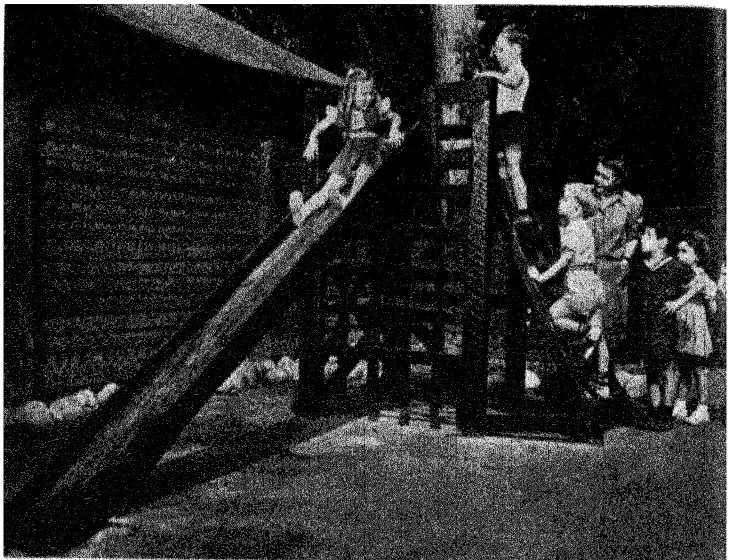
In such activities as the above Young America is expressing itself on problems of importance to them. Here are builded the future statesmen and leaders America has to have. Equipment helps get the job done. Courtesy Midland, Tex. Public Schools. Esther Bubley photo.

or wagons mounted on rubber wheels and built so as to provide space for the machine with storage for machines not in use, and records and films on a lower shelf or compartment. Such a device makes it unnecessary to have special tables and storage in the various rooms, and is economical of time and energy.

Screens are of two types, fixed and portable; outside of the auditorium the movable screen is to be preferred. Take care that the material of your screen is as soilproof as possible. Keep it clean.

A central storage and work room in a building is quite necessary for audio-visual aids. This room should be equipped with a projector space to preview films. It should have a work table for rewinding and repairing film. Most important is storage space for films, records, machines, maps, globes, and other materials.

Maps, globes, and other visual materials of this type are too expensive to equip each space with its own private collection. They should be available when and where needed. They are numerous in amount, and helpful in good teaching. The main things to keep in mind about audio-visual equipment are: (1) it is indispensable for good teaching, (2) it should be available when and where needed, (3) keep it in good repair, and (4) add to it constantly.



Playground slides delight the little ones, and teach muscular coordination, self-confidence, and team play. Courtesy United States Office of Education.

All kinds of playground equipment find a useful place in the development of children. Bayway Community Center, Elizabeth, N. J. Courtesy Standard Oil Co. (N. J.).

Playground Equipment

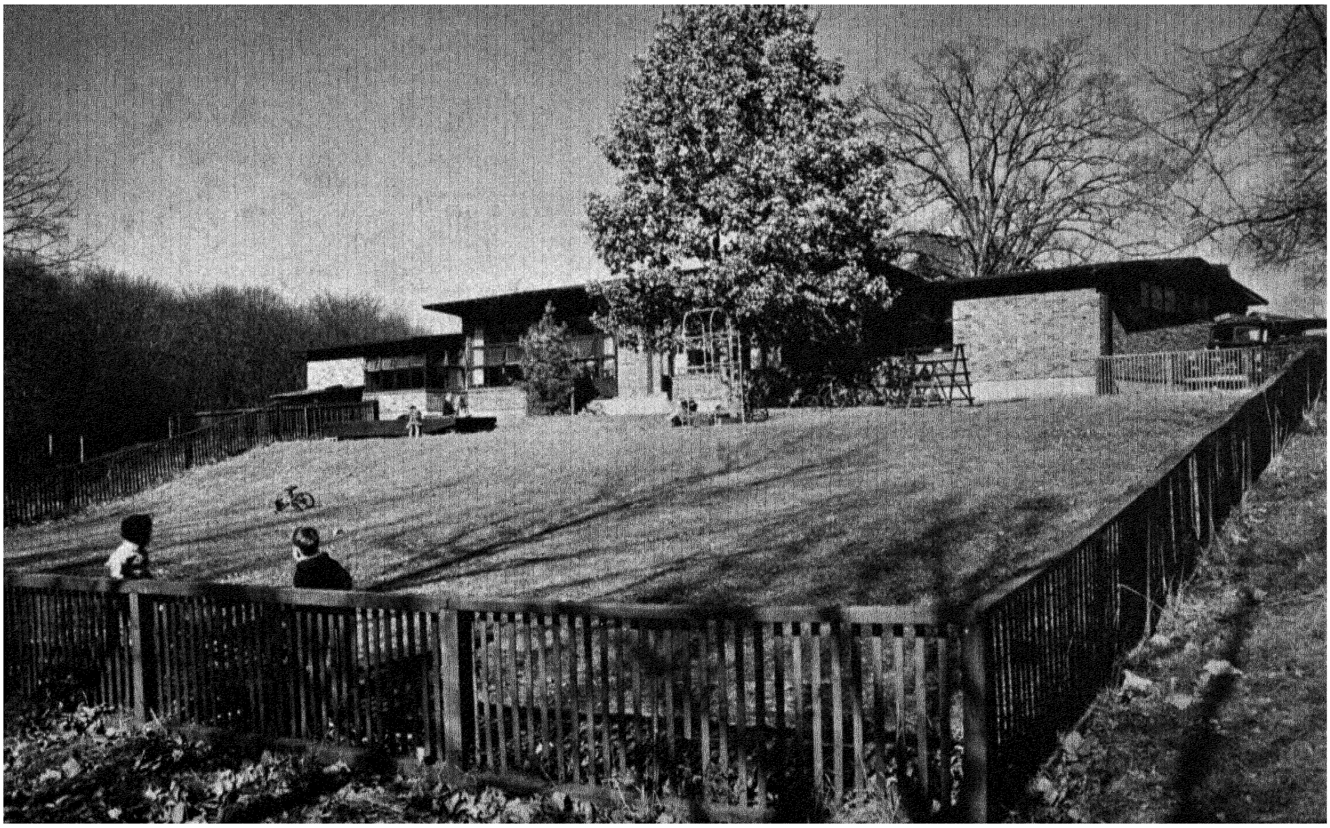
Equipment is as essential for the activities which go on outside the building as for those conducted in the building. The uses to which the equipment is to be put determines the quality and quantity needed. The little folks' playgrounds should have swings, sand boxes, jungle gym, seesaws, and other simple devices. Many of these things can be built on the premises. Rustic seats arranged informally under trees and close to shrubbery should be provided in some amount. After all, green grass, to sit and play on, the good earth, to use in many ways, trees which can be climbed, and pools in which to wade and sail boats are about the best equipment for any school grounds.

Older children, youth, and adults, probably need less formal equipment and more game facilities. Facilities in terms of goalposts, nets, etc., are of course musts for such formal games as tennis, volley and basketball, baseball, football, etc. Bicycle racks placed in strategic and safe places fill a well-felt need in many situations. Again there is the need for seating to watch others at play, or just to enjoy nature and her ways. It has always been a curious thing that school grounds pro-

A delight to every child—a necessity on every elementary school grounds. Courtesy Farm Security Administration. Lee photo.

A school plant has an *outside* as well as an *inside*. The school grounds are at least as important as the inside of a building. Many things can be learned better outside of a building than anywhere else. Let's grow people outside our school buildings and then there will be no place for weeds. Clyde Lyon School, Glenview, Ill. Perkins & Will architects. Hedrich-Blessing photo.

Someone has said that the less ground a school plant has, the greater the need for playground equipment. Harris Armstrong Community School.



vide so few facilities for rest and relaxation. Could it be that people think they must be doing some active physical exercise in order to recreate?

Janitorial Equipment

The persons responsible for keeping a plant clean, warm, neat, and wholesome need tools with which to work. Brooms of various sizes and shapes, individual vacuum cleaners with a full line of gadgets, mops, shovels, rakes, spades, hoes, plenty of rubber hose with sprinkling attachments, wheelbarrows, motor and hand driven mowers, ladders, shears, scrub buckets and pails, and plenty of cheese cloth are among the tools of the trade the janitor uses. Convenient places must be provided to house them, repair them, take care of them. A well-equipped janitor's supply room looks like a small hardware store. A good janitor is an important individual. He might be described as a specialist in carpentry, masonry, landscaping, engineering, machine shop, heating and ventilating, and a diplomat. Someone has said that it takes a lot of specialization to make one janitor.

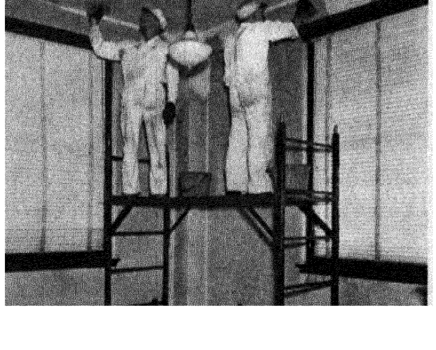
Janitors work at a lot of different jobs; they have to. They get dirty and grimy but they have to be ready to meet a group of important visitors to the building, or participate in a conference in the principal's office. So they have to have a place to change clothes, to clean up, to take a shower, to hang up one outfit of clothes while downing another. They also need a place to relax, smoke a pipe, read a newspaper, stretch out, and get off their feet. Such a janitor's boudoir then is a practical place, an essential place, and a well-equipped place.

A janitor has to be a handy-andy. In the course of a day he has to put in a window light, fix a door knob, replace a bolt, fix a broken chair, solder a kettle. He has to have a place to do such things. He needs a workshop, and that workshop has to be equipped with the tools he needs. Any successful farmer knows what we are talking about. The general repair man usually found in every small town knows. This workroom of his in addition to light machine tools and hammers, and wrenches, and the like must have a variety of bins and shelves for extra parts and replacements. These things are necessities for our janitors.

Jottings From Our Note Books

Some thoughts come to mind about other things which are needed in the well-equipped school and for which provision should be

The proper care and maintenance of our school plants have a lot to do with use. Scores of different tasks are involved Many kinds of equipment aid tremendously. Here are pictured a few of the articles which can be used to good advantage in every school.



made. We pass them on by way of suggestion.

Little children learn a lot by looking at themselves. Why not install in rooms for little folks one or more full length mirrors, say four feet high, and three feet wide?

Choose the furniture and what-have-you for principal's and other administrative offices so that they look inviting and comfortable rather than austere and forbidding. Upholstered chairs, rugs on the floor, pictures on the wall all informally arranged add much to such places. The reason so many children and adults alike hate to go to "the office" is due to its frigid appearance.

Make sure that there is provision for several electrical outlets. Locate them in the exterior and corridor walls. Never place them in a wall separating two rooms. It may need moving. Some advocate that the floor is the best place for electrical outlets. Could be.

A master clock system with a clock for every room and particularly the janitor's office is a must for every building of any size. The corridor wall is probably the best location. Don't locate it too high up. Why should anyone get a crick in the neck trying to see the clock face? How about locating the master clock in the janitor's office rather than the principal's? The janitor is the one who adjusts it, you know.

Place a paper towel dispenser beside every lavatory and sink. These should be planned for when the building is in the drawing-board stage. It makes a difference. Why can't someone design a container which will dispense any type or brand of paper towel?

A small shelf on which to place books and other paraphernalia is needed in each toilet partition. Why expect people to put their belongings on the floor? Yet there is no other recourse in most school toilet rooms. A simple shelf takes care of the situation.

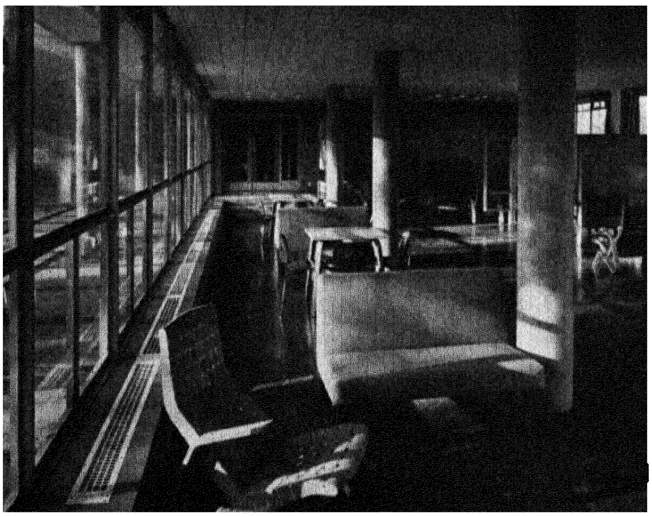
Don't let anyone tell you that light coming in north windows does not cause glare or does not need to be controlled. It just ain't so. Also, glass block of any sort needs proper shading to control brilliant light beating against it. The answer is that all windows need louvers inside or out. If venetian blinds are used they are as necessary on north windows or glass block as elsewhere.

Use furniture that will give the library a homelike, cheerful, friendly atmosphere. Make it a place people will want to use. Rugs on the floor, tables of different sizes and shapes, some easy chairs, pictures on the wall, drapes at the windows, open shelves around the room that users can reach, special shelves for magazines, a "friendly" desk for the librarian—these things all help. They can be provided. They need not cost more money. They require imagination, forethought, and a willingness to break with tradition.

Fit up one room for parents. Make it look like the living room you have always wanted in your home. Furniture, pictures, gadgets should be chosen because people will be comfortable, will want to use the room, will enjoy themselves. Such a room in every school building will pay big dividends. Less energy spent on telling people how good their schools are and more spent in making the school the nicest and most comfortable place in town makes horse sense.

Good equipment has its place in the headquarters of the school—the office. The office is the focal point at which staff, public, and pupils meet. Courtesy Remington-Rand.

Reception rooms should be restful places. Easy furniture in a sunny room helps to provide that feeling of relaxation. Birch Hall, Antioch College, Yellow Springs, Ohio. Saarinen, Saarinen & Associates architects, Max G. Mercer associate architect. Dearborn-Massar photo. Courtesy *Progressive Architecture.*



CHAPTER 10: Need for Educational Plants

A study of the need for more schools in this abundant land undrapes a dramatic display of raw and staggering paradoxes. Here are cited a few.

The southern states, with about a third of U. S. children, account for only about one-eighth of the nation's wealth. Actually some of the *least* wealthy states have the *greatest* proportionate school population. This discrepancy is so great that in some states there are 50 percent more children in proportion to population than in other states.

There is five times as much taxable income per child in the wealthiest state as in the poorest state.

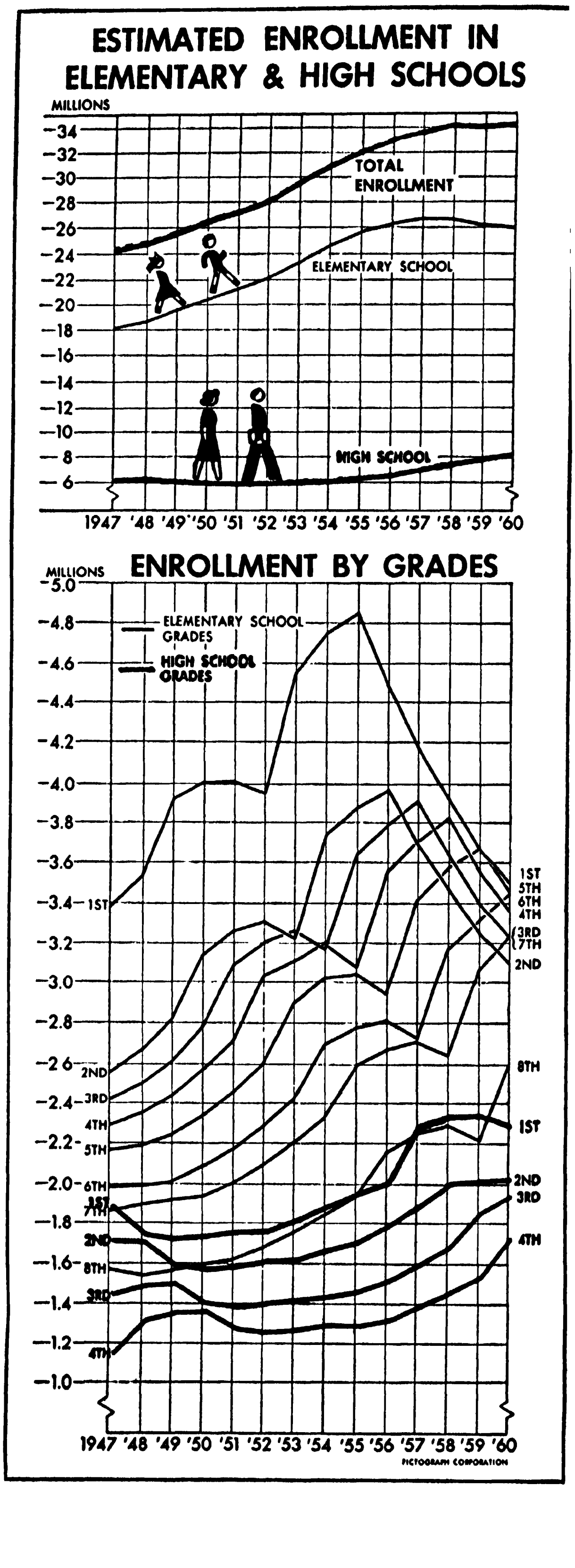
Expenditures per child for education in some communities are sixty times greater than in others.

And the need for more school buildings, better school buildings, is alarmingly great, even in areas of wealth.

Since 1930 relatively few new buildings have been built. During the depression in the 30's few communities felt that they could afford to build; at least they were unwilling to do so. During World War II building stopped because of lack of materials and labor. Since the war these scarcities have continued and costs have risen to such heights as to frighten many communities away from the plunge into construction that is inevitable.

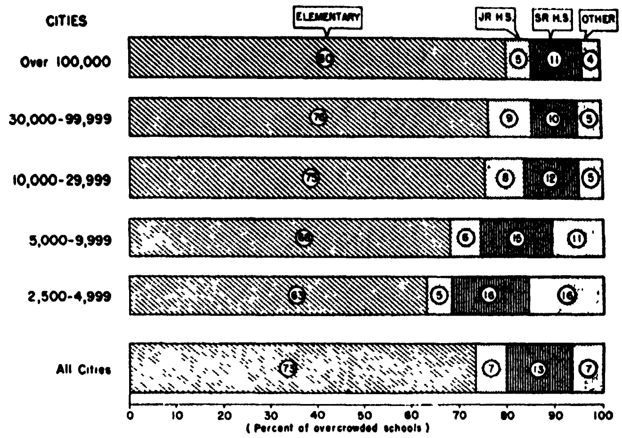
A blow of nature has turned scarcity into famine. The U. S. birth rate varied in the years before the war between 2,200,000 and 2,500,000 annually. During and since the war the rate has risen to 3,500,000, reaching to 3,900,000 in 1947! According to U. S. census figures, the total number of births in the United States for the years 1940-47, inclusive, was 23,137,000 as against 17,483,000 births in the years 1932-39, inclusive.

Those war babies have started to school. They continue to load already overloaded schools by succeeding waves. In some grades the increase over 1947 will exceed 50 percent by 1955. How these succeeding peaks will swell school population is shown in the illustrations based on projections made by the U. S. Bureau of Census under a special grant from *Parents' Magazine* and The American Parents' Committee. Obviously, there is and will be need for educational plants throughout the land.



Courtesy *Parents Magazine*, September 1948.

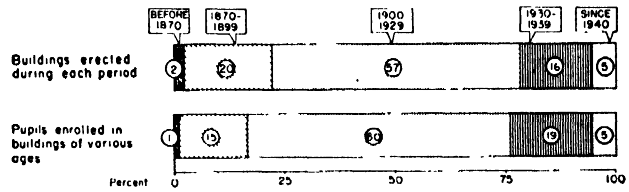
PERCENT OF THE OVERCROWDED SCHOOLS THAT ARE OF EACH TYPE



Read chart as follows In cities over 100,000 in population 80 percent of the overcrowded buildings are elementary schools, 5 percent are junior high schools, 11 percent are senior high schools, and 4 percent are schools of other types (combined types or special schools) Similarly read other bars

School building construction has not kept pace with present needs, much less the needs of the next decade. *National Education Association Research Bulletin,* December 1948, page 147.

PERCENT OF SCHOOL BUILDINGS ERECTED AT DIFFERENT INTERVALS AND THE PERCENT OF PUPILS ENROLLED IN THEM



Already the increased enrollments are appearing in the elementary schools, creating a serious problem of overcrowding. *National Education Association Research Bulletin,* December 1948, page 149.

CENSUS BUREAU'S FORECAST OF FUTURE SCHOOL ENROLLMENT BY GRADES

YEAR	Elementary School Grades 1	2	3	4	5	6	7	8	Total Elementary School	High School Grades 1	2	3	4	Total High School	GRAND TOTAL
1947....	3,394,000	2,565,000	2,421,000	2,298,000	2,174,000	1,980,000	1,864,000	1,573,000	18,269 000	1,908,000	1,737,000	1,465 000	1,167,000	6 277,000	24,546,000
1948 ...	3,541,000	2,676,000	2,505,000	2,355 000	2,181,000	1,996,000	1,892,000	1,540,000	18,686,000	1,766,000	1,728,000	1,507,000	1,320 000	6 321 000	25,007,000
1949 ...	3,926,000	2,829,000	2,625,000	2,447,000	2,248,000	2,015,000	1,917,000	1,572,000	19,579,000	1,730,000	1,609,000	1,510,000	1,370,000	6,219,000	25,798,000
1950....	4,048,000	3,154,000	2,780,000	2,570,000	2,343,000	2,088,000	1,939,000	1,599,000	20,521,000	1,746,000	1,580,000	1,411,000	1,377,000	6,114 000	26,635,000
1951....	4,082,000	3,263,000	3,090,000	2,712,000	2,456,000	2,173,000	2,004,000	1,614,000	21,394,000	1,761,000	1,591,000	1,385,000	1,283,000	6,020,000	27,414,000
1952 ...	3,956,000	3,315,000	3,209,000	3,030,000	2,604,000	2 288,000	2,096,000	1,674,000	22,172,000	1,767,000	1,612,000	1,402,000	1,264,000	6,045,000	28,217,000
1953 ...	4,558,000	3,229,000	3,260,000	3,146,000	2,909,000	2,426,000	2,206,000	1,753,000	23,487,000	1,816,000	1,619,000	1,421,000	1,279,000	6,135 000	29,622,000
1954 .	4,754,000	3,741,000	3,174,000	3,194,000	3,022,000	2,712,000	2,338,000	1,846,000	24,781,000	1,883,000	1,665,000	1,429,000	1,297,000	6,274,000	31,055,000
1955 ...	4,841,000	3,872,000	3,640,000	3,078,000	3,040,000	2,788,000	2,590,000	1,940,000	25,789,000	1,954,000	1,711,000	1,458,000	1,293,000	6,416,000	32,205,000
1956....	4,483,000	3,976,000	3,786,000	3,552,000	2,944,000	2,819,000	2,675,000	2,159,000	26,394,000	2,047,000	1,786,000	1,511,000	1,327,000	6,671,000	33,065,000
1957....	4,184,000	3,704,000	3,900,000	3,706,000	3,408,000	2,738,000	2,714,000	2,240,000	26,594,000	2,268,000	1,880,000	1,583,000	1,379,000	7,110,000	33,704,000
1958....	3,929,000	3,475,000	3,643,000	3,827,000	3,570,000	3,179,000	2,645,000	2,281,000	26,549,000	2,337,000	2,093,000	1,674,000	1,451,000	7,555,000	34,104,000
1959....	3,668,000	3,258,000	3,404,000	3,565,000	3,672,000	3,316,000	3,060,000	2,217,000	26,160,000	2,350,000	2,150,000	1,856,000	1,530,000	7,886,000	34,046,000
1960 ...	3,506,000	3,103,000	3,233,000	3,374,000	3,465,000	3,456,000	3,233,000	2,599,000	25,969,000	2,279,000	2,190,000	1,932,000	1,721,000	8,122,000	34,091,000
PERCENT CHANGE SINCE PRECEDING YEAR															
1948....	+ 43	+ 43	+ 35	+ 25	+ 03	+ 08	+ 15	− 2.1	+ 23	− 74	− 05	+ 29	+131	+ 07	+ 19
1949 ...	+109	+ 57	+ 48	+ 39	+ 3.1	+ 10	+ 1.3	+ 21	+ 48	− 20	− 69	+ 02	+ 38	− 16	+ 32
1950....	+ 31	+11.5	+ 59	+ 50	+ 42	+ 36	+ 1.1	+ 17	+ 48	+ 09	− 18	− 66	+ 05	− 17	+ 32
1951....	+ 0.8	+ 35	+11.2	+ 55	+ 48	+ 41	+ 34	+ 09	+ 43	+ 0.9	+ 07	− 18	− 68	− 15	+ 29
1952 ...	− 31	+ 16	+ 39	+11.7	+ 60	+ 53	+ 46	+ 37	+ 3.6	+ 03	+ 13	+ 1.2	− 1.5	+ 04	+ 29
1953....	+152	− 26	+ 1.6	+ 38	+117	+ 60	+ 5.2	+ 4.7	+ 5.9	+ 28	+ 04	+ 1.4	+ 1.2	+ 1.5	+ 50
1954....	+ 43	+15.9	− 26	+ 15	+ 39	+118	+ 60	+ 53	+ 55	+ 37	+ 28	+ 06	+ 14	+ 23	+ 48
1955....	+ 1.8	+ 35	+147	− 36	+ 06	+ 28	+108	+ 51	+ 41	+ 38	+ 28	+ 20	- 03	+ 23	+ 37
1956....	− 7.4	+ 27	+ 40	+154	− 32	+ 1.1	+ 3.3	+113	+ 23	+ 48	+ 44	+ 3.6	+ 26	+ 40	+ 2.7
1957....	− 67	− 68	+ 30	+ 43	+158	− 2.9	+ 15	+ 38	+ 08	+108	+ 53	+ 48	+ 39	+ 6.6	+ 1.9
1958....	− 61	− 62	− 66	+ 33	+ 48	+161	− 25	+ 18	− 02	+ 30	+11.3	+ 57	+ 52	+ 63	+ 12
1959....	− 66	− 62	− 66	− 6.8	+ 29	+ 43	+157	− 28	− 15	+ 06	+ 27	+109	+ 54	+ 44	− 02
1960....	− 44	− 48	− 50	− 5.4	− 56	+ 4.2	+ 5.7	+17.2	− 07	− 3.0	+ 19	+ 4.1	+12.5	+ 30	+ 0.1
PERCENT CHANGE SINCE 1947															
1948 ...	+ 43	+ 43	+ 35	+ 25	+ 03	+ 0.8	+ 15	− 2.1	+ 23	− 74	− 05	+ 29	+131	+ 07	+ 1.9
1949....	+157	+103	+ 84	+ 65	+ 34	+ 1.8	+ 28	− 0.1	+ 72	− 93	− 74	+ 3.1	+174	− 09	+ 51
1950....	+193	+230	+148	+118	+ 78	+ 5.5	+ 4.0	+ 17	+123	− 85	− 90	− 3.7	+180	− 26	+ 8.5
1951....	+203	+272	+276	+180	+13.0	+ 9.7	+ 7.5	+ 2.6	+17.1	− 7.7	− 84	− 55	+ 99	− 4.1	+11.7
1952....	+166	+292	+325	+319	+198	+156	+12.4	+ 64	+214	− 7.4	− 72	− 43	+ 83	− 37	+150
1953 ...	+34.3	+25.9	+347	+369	+338	+225	+183	+11.4	+286	− 48	− 68	− 30	+ 96	− 2.3	+207
1954....	+401	+458	+31.1	+390	+390	+370	+254	+174	+356	− 1.3	− 4.1	− 25	+11.1	—	+26.5
1955....	+426	+510	+504	+339	+398	+40.8	+38.9	+233	+41.2	+ 2.4	− 15	− 05	+108	+ 22	+312
1956....	+32.1	+550	+564	+546	+354	+42.4	+435	+37.3	+445	+ 73	+ 28	+ 31	+137	+ 63	+34.7
1957....	+233	+444	+611	+613	+568	+38.3	+456	+424	+456	+189	+ 8.2	+ 8.1	+182	+133	+373
1958....	+158	+355	+505	+665	+642	+606	+41.9	+450	+453	+22.5	+205	+143	+24.3	+204	+389
1959....	+ 81	+270	+406	+55.1	+689	+675	+642	+409	+432	+23.2	+238	+267	+311	+256	+38.7
1960....	+ 33	+210	+33.5	+468	+59.4	+745	+73.4	+652	+42.1	+19.4	+26.1	+31.9	+47.5	+29.4	+389

Individual figures are rounded to nearest thousands. Percentage not shown when less than 0.05.

Courtesy *Parents Magazine,* September 1948.

In commenting on these awesome figures of school population growth, Mr. George J. Hecht, editor of *Parents' Magazine*, says: "Many people do not realize that the school situation is not likely to get better but actually is likely to get much, much worse during the next ten years. Never was the future so dark for American school children as it is today. In five years we are apt to look back upon 1948 as an educational utopia—unless a tremendous effort is made all over the country to meet the crisis."

So let us see what kind of a "utopia" people may look back upon, unless action — and building—get under way.

In this—the world's only land of plenty—Mr. Hecht points out that there are four million children of school age not attending any school at any time.

Many children are going to school only six months of the year, instead of full term.

Some communities provide no public schooling beyond the eighth grade.

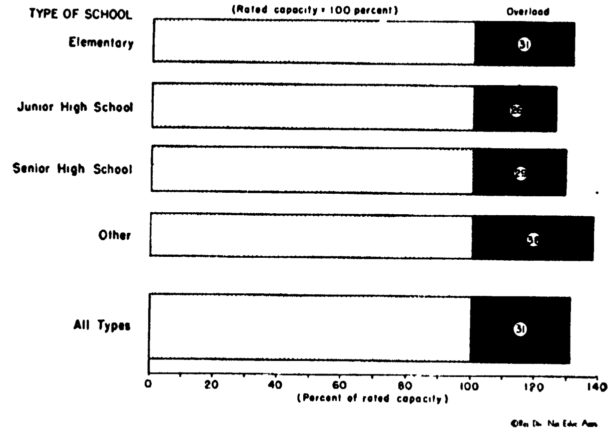
And an untold number of overcrowded, unsafe school buildings are struggling along under a terrific load with two or more classes held in one room, and with part-time instruction for pupils who just cannot be accommodated for a full schedule.

American population moves constantly. People leave their flocks and firesides to seek a new and hoped-for better life in urban industrial communities. City residents move to suburban areas to enjoy part-time release from the downtown confusion and noise and crowding. New industries move, and workers move with them. Southerners become Yankees, in location if not in spirit. Easterners move West. Climate causes people to move to those areas they consider most favorable, for health or aesthetic reasons. And new housing developments since the war, constructed or projected, have helped to keep the U. S. population in motion. The construction of new schools and the development of good school programs are quite important reasons for people to move from a less favored area to one where better living and growing for their children are offered. Thus, in addition to rapid increase nationally in the school population, there are sharp and continuing fluctuations as the population shifts from community to community.

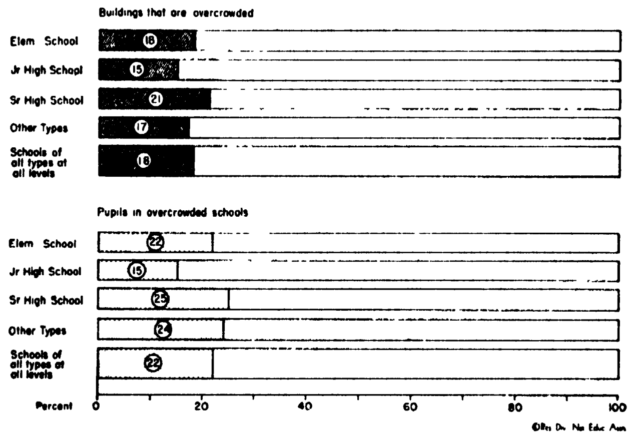
But that is not all. The trend, in spite of these deficiencies, is toward zooming growth. The schooling segment in the life of the young American is being extended at both ends. In the early 1900's, Joseph Doakes was exceptional if he continued school past the eighth grade. Why should he? Most youngsters did

Realistic action by communities is needed if the problem of overcrowded schools is to be solved. *National Education Association Research Bulletin*, December 1948, page 150.

EXCESS OF ACTUAL ENROLMENT OVER RATED CAPACITY FOR THE OVERCROWDED SCHOOL BUILDINGS REPORTED BY 1597 CITY SYSTEMS

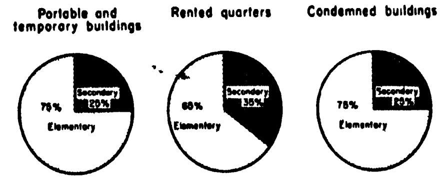


PERCENT OF CITY SCHOOLS OF EACH TYPE THAT ARE OVERCROWDED AND THE PERCENT OF PUPILS ATTENDING SCHOOL IN OVERCROWDED BUILDINGS



Is your school district one that has 25% of its pupils in an overcrowded learning situation? *National Education Association Research Bulletin*, December 1948, page 151.

PERCENT OF THE PUPILS HOUSED IN MAKESHIFT QUARTERS WHO ARE IN ELEMENTARY AND SECONDARY SCHOOLS, RESPECTIVELY

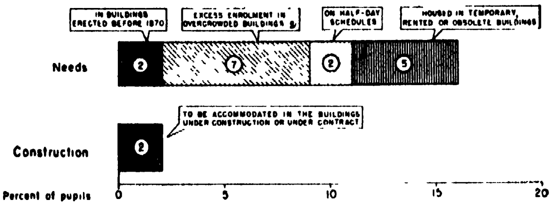


__Read chart as follows:__ 75 percent of all the pupils housed in portable and other temporary school buildings are enrolled in elementary schools and 25 percent secondary schools Similarly interpret the other two circles

Res. Div. Nat. Educ. Assn.

Any school district without adequate, permanent school housing to accommodate today's enrollment, plus forecasted local enrollments, should have a basic school plant expansion program. *National Education Association Research Bulletin,* December 1948, page 155.

PERCENT OF PUPILS NOW IMPROPERLY HOUSED AND THE PERCENT FOR WHOM NEW BUILDINGS ARE IN IMMEDIATE PROSPECT



a/ Since 22 percent of the pupils are housed in buildings which, on the average, carry a 31 percent overload, the excess enrolment for whom additional housing is needed is approximately 7 percent

Res. Div. Nat. Educ. Assn.

Communities with progressive leadership have started upon action which will place them ahead of other communities. *National Education Association Research Bulletin,* December 1948, page 166.

State	Percent of children 5-17 enrolled								
	1870-1871	1879-1880	1889-1890	1899-1900	1909-1910	1919-1920	1929-1930	1939-1940	1945-1946
Continental U.S.	**61.5**	**65.5**	**68.6**	**72.4**	**73.5**	**77.8**	**81.3**	**85.3**	**80.5**
Alabama	40.4	42.6	55.8	61.7	62.5	74.1	76.2	85.2	84.4
Arizona	-	53.2	52.7	51.9	62.5	88.0	88.6	84.8	73.0
Arkansas	40.3	30.8	55.4	71.0	80.1	85.7	81.5	87.0	79.6
California	63.6	73.4	77.4	79.6	79.7	102.5	93.8	95.9	88.4
Colorado	42.3	60.8	72.2	88.2	90.3	95.0	92.2	87.5	84.1
Connecticut	80.8	77.0	72.0	74.5	74.4	80.3	79.3	80.7	75.2
Delaware	50.0	65.2	66.2	75.3	71.8	73.3	73.5	80.8	75.8
Florida	21.2	44.2	71.1	66.6	68.5	82.6	91.5	86.6	81.5
Georgia	11.9	46.2	58.5	65.3	66.7	74.0	79.7	88.1	85.5
Idaho	46.1	77.9	62.7	79.2	88.7	94.8	95.1	95.7	85.6
Illinois	81.0	74.6	72.0	72.7	72.3	72.1	78.9	80.4	76.3
Indiana	78.6	82.4	79.2	81.1	78.7	79.4	85.2	90.4	85.8
Iowa	84.4	83.5	85.5	89.1	87.4	86.1	90.2	91.0	87.5
Kansas	74.2	73.2	88.6	89.2	89.2	87.9	90.5	93.7	90.9
Kentucky			65.6	75.3	73.5	76.2	78.1	79.5	75.2
Louisiana	24.8	25.9	31.6	43.6	50.8	63.5	71.7	76.3	71.8
Maine	87.4	89.8	85.9	81.4	84.9	76.3	78.9	82.3	77.4
Maryland	46.7	58.1	60.4	67.0	70.1	66.9	68.9	72.8	72.1
Massachusetts	72.3	71.8	72.6	76.2	71.3	71.3	76.0	78.6	72.1
Michigan	79.7	78.1	73.5	77.1	78.3	79.3	81.2	83.0	74.7
Minnesota	75.9	75.9	74.6	77.6	78.3	81.8	84.0	82.9	79.8
Mississippi	40.6	61.3	70.6	73.3	80.2	69.8	97.1	97.2	89.5
Missouri	56.0	68.9	74.4	78.6	82.2	78.3	76.3	86.2	83.1
Montana	70.2	63.8	71.1	72.8	81.7	92.2	85.3	85.0	82.1
Nebraska	58.8	68.5	75.4	89.5	87.0	90.5	90.9	91.4	86.1
Nevada	54.0	79.7	73.8	74.1	75.9	91.5	94.9	100.4	102.8
New Hampshire	91.3	81.3	71.3	74.0	67.0	64.3	68.0	72.2	68.0
New Jersey	63.2	64.8	62.2	68.5	70.6	77.4	80.4	85.2	85.8
New Mexico	4.4	13.3	42.3	61.4	59.3	75.4	80.2	86.7	83.0
New York	83.0	77.1	70.7	69.6	68.7	72.8	76.7	86.0	80.2
North Carolina	31.2	55.9	56.4	63.6	73.4	82.4	84.1	86.3	83.6
North Dakota	39.3	41.7	71.3	81.3	86.1	84.6	83.0	83.6	78.0
Ohio	84.0	76.7	76.5	75.4	74.4	76.6	79.9	84.3	77.3
Oklahoma				79.8	83.1	92.6	98.2	101.2	84.3
Oregon	67.7	75.0	74.8	82.1	80.2	84.1	94.6	90.8	84.4
Pennsylvania	76.4	74.4	69.5	68.9	67.2	71.5	76.0	82.2	76.4
Rhode Island	59.2	59.6	62.7	66.8	63.8	65.4	69.9	75.8	72.0
South Carolina	27.3	40.6	47.1	60.7	67.3	83.9	86.2	85.7	83.5
South Dakota	([1])	([1])	81.0	79.5	78.1	82.9	84.7	86.1	80.8
Tennessee	32.0	58.2	74.1	75.1	79.5	87.6	83.5	85.6	80.8
Texas	21.0	42.4	59.5	64.7	67.3	73.4	80.4	82.8	78.3
Utah	53.4	50.6	55.3	81.0	84.5	87.2	89.8	91.7	86.9
Vermont		87.2		82.2	80.4	73.4	75.3	79.2	69.3
Virginia	32.3	45.0	60.5	63.2	64.2	73.3	78.6	82.2	81.2
Washington	69.0	72.4	70.7	87.9	86.2	94.1	96.6	98.6	88.6
West Virginia	49.5	69.2	75.3	78.6	78.2	79.8	76.0	86.3	83.7
Wisconsin	72.9	73.8	69.8	72.5	72.5	68.2	75.8	76.4	73.5
Wyoming	45.3	77.4	54.5	65.7	81.6	91.6	94.3	97.1	90.6
Dist of Col	41.6	55.4	63.1	76.8	84.7	84.3	91.9	90.7	84.0

[1] Included in report for North Dakota

The percentage of children in the 5-17 age group enrolled in public schools in the United States has increased from 61.5% in 1870-71 to 80.5% in 1945-46. *Statistics of State School Systems,* 1945-46 Chapter II, United States Office of Education, Table 15, pages 50-51.

Estimates of School Plant Needs and Costs for Ensuing Five Years

State	Estimated Number of Classrooms Needed for			Estimated Costs Based on		
	Re-placement	Addi-tional Facilities	Total Needed	Studies	Rough Estimates	Total Needed
Ala.	8,000	11,000	19,000	$ 75,000,000	$103,000,000	$ 178,000,000
Ariz.	No Information§			...	36,000,000	36,000,000
Ark.	2,000	2,500	4,500	...	50,000,000	50,000,000
Calif.	...	...	20,000	1,255,000,000	...	1,255,000,000
Colo.	No Information			...	35,000,000	35,000,000
Conn.	1,397	2,204	3,601	116,000,000	...	116,000,000
Del.	20	125	145	...	5,000,000	5,000,000
Fla.	1,704	7,930	9,634	192,673,000	...	192,673,000
Ga.	7,017	2,301	9,318	128,904,000	...	128,904,000
Idaho	3,250	3,250	6,500	...	50,000,000	50,000,000
Ill.	1,500	6,000	7,500	...	200,000,000	200,000,000
Ind.	900	5,200	6,100	...	210,000,000	210,000,000
Iowa	5,000	5,000	10,000	...	50,000,000	50,000,000
Kans.	4,000	1,000	5,000	...	75,000,000	75,000,000
Ky.	1,000	4,000	5,000	100,000,000	...	100,000,000
La.	2,513	2,756	5,269	129,035,000	...	129,035,000
Maine	791	811	1,602	...	50,000,000	50,000,000
Md.	1,154	1,948	3,102	...	108,000,000	108,000,000
Mass.	No Information§				237,000,000	237,000,000
Mich.	10,000	10,000	20,000	400,000,000	...	400,000,000
Minn.	500	2,500	3,000	...	200,000,000	200,000,000
Miss.	5,000	1,000	6,000	50,000,000	...	50,000,000
Mo.	6,000	4,000	10,000	...	125,000,000	125,000,000
Mont.	1,500	1,700	3,200	...	44,800,000	44,800,000
Nebr.	1,000	250	1,250	...	25,000,000	25,000,000
Nev.	189	223	412	...	6,180,000	6,180,000
N.H.	1,050	775	1,825	32,500,000	...	32,500,000
N.J.	5,000	3,000	8,000	250,000,000	...	250,000,000
N.Mex.	1,000	1,500	2,500	...	40,000,000	40,000,000
N.Y.	...	...	30,640	1,261,822,000	...	1,261,822,000
N.C.	...	...	6,052	157,865,000	...	157,865,000
N.Dak.	150	100	250	...	3,000,000	3,000,000
Ohio	2,000	5,000	7,000	...	175,000,000	175,000,000
Okla.	5,000	3,000	8,000	...	80,000,000	80,000,000
Oreg.	1,500	2,500	4,000	...	60,000,000	60,000,000
Pa.	...	...	20,000	...	500,000,000	500,000,000
R.I.	No Information			...	15,000,000	15,000,000
S.C.	12,000	3,000	15,000	90,000,000	...	90,000,000
S.Dak.	300	400	700	...	14,000,000	14,000,000
Tenn.	8,600	2,690	11,290	110,000,000	...	110,000,000
Texas	...	...	2,000	...	250,000,000	250,000,000
Utah	843	1,012	1,855	81,000,000	...	81,000,000
Vt.	600	50	650	...	16,000,000	16,000,000
Va.	No Information‖			No Information‖		
Wash.	2,000	7,000	9,000	...	200,000,000	200,000,000
W.Va.	2,000	3,000	5,000	...	90,000,000	90,000,000
Wis.	...	...	5,000	...	100,000,000	100,000,000
Wyo.	No Information			...	12,000,000	12,000,000
Total for 42 states			298,895	Total for 47 states		$7,595,129,000

§ Survey under way at present
‖ A legislative commission is now making an exhaustive study in this field and its report will not be available until the fall of 1949.

Conservative estimates of school building needs emphasize the necessity for planning and action to resolve the problem of providing adequate facilities for communities. *The Forty-Eight State School Systems,* The Council of State Governments, Chicago, Ill., Table 39, page 212.

not. As the middle of the century approached, more and more hundreds of thousands were attending one, two, or even the full four years of the high school course. And many more thousands were going on into college ranks, swelling enrollments at established schools, demanding community colleges with at least two years' of study beyond high school.

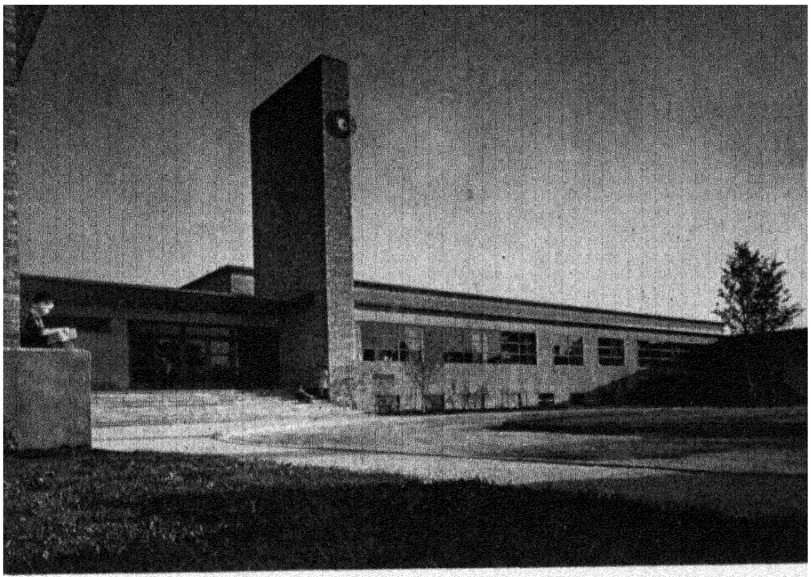
At the other end of the scale nursery schools and kindergarten schools have mushroomed throughout the nation. They fill a felt need. They demand special buildings, constructed to give the pre-school tot a pleasant introduction to his own development.

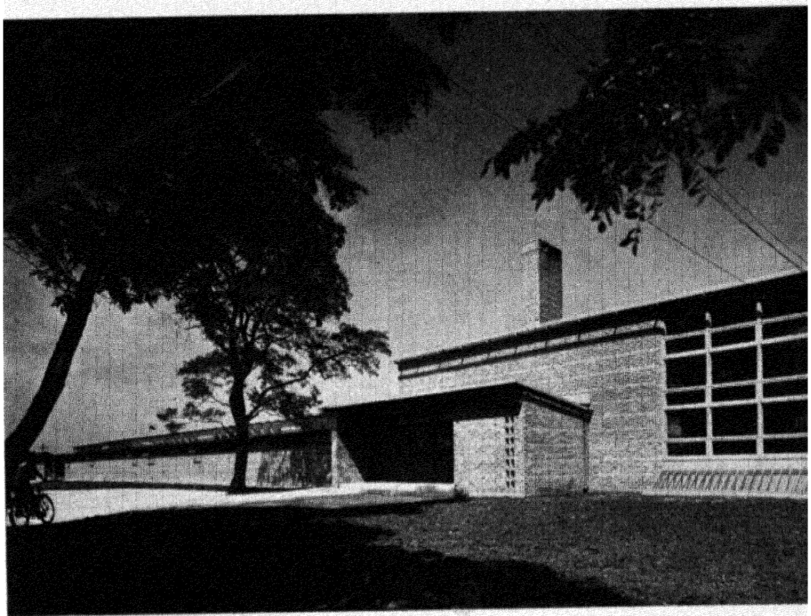
Let us examine again the multiplicity of ways in which the new school is called upon to serve its community, its constantly expanding program of instruction and services. As a school, it no longer serves by serving up the three R's. Its instruction methods have changed, demanding more room. And the number of things it teaches, the number of ways it serves its community, have multiplied and will keep on multiplying.

The curriculum not only reaches more people, it also reaches them in infinitely more ways. And the people affected are not only pupils, but those of the community who are past school age. Child care, feeding services, guidance, health services, family welfare, home management, shops for vocational training and avocational enjoyment, and recreation—these are only a few of the ways the new school acts as an important nucleus for community life. The new school's job is bigger, and still growing; the new school plant should be bigger, and designed for growth.

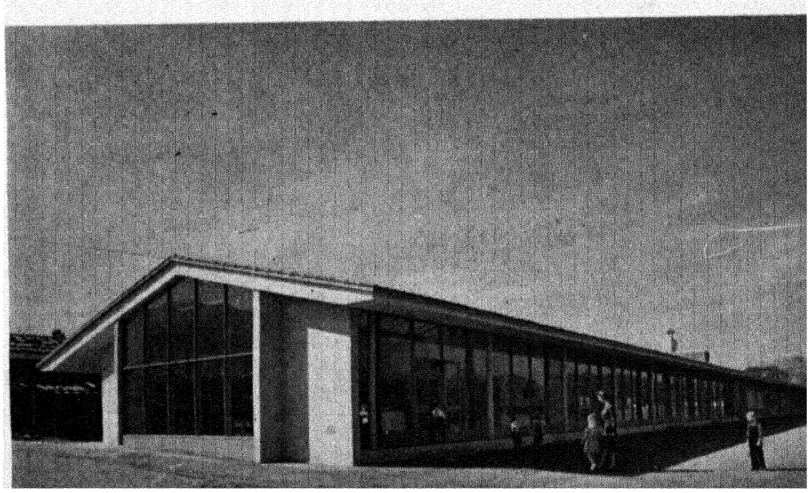
Those needs will continue to be specific needs, peculiar to each community and to each community's plans and program. That the needs are tremendous is shown by the figures for the nation as a whole. Those needs may be even much greater in communities which have grown more than average during the war years.

A large part of the need for educational plants arises from the fact that while most communities have had one or more buildings called schools, many of these buildings, in fact the majority, were and are ill adapted for the growing functions of modern education. It has been mentioned that the designing of school plants for the specific purpose of housing an educational program is relatively new; that thousands of school buildings still standing, and still operating, after a fashion, were designed from the outside in, to re-create some former style of architecture. Today the attitudes, at least, of architects and school officials have improved. These planners are





Can you expect to find a modern school in the community into which you are planning to move? Top: Crow Island School, Winnetka, Ill. Eliel Saarinen, Eero Saarinen, Perkins, Wheeler & Will, architects. Hedrich-Blessing photo. Middle: Rugen School, Glenview, Ill. Perkins, Wheeler & Will architects. Hedrich-Blessing photo. Courtesy *Progressive Architecture*. Bottom: Laurel Elementary School, San Mateo, Cal. E. Kump architect.

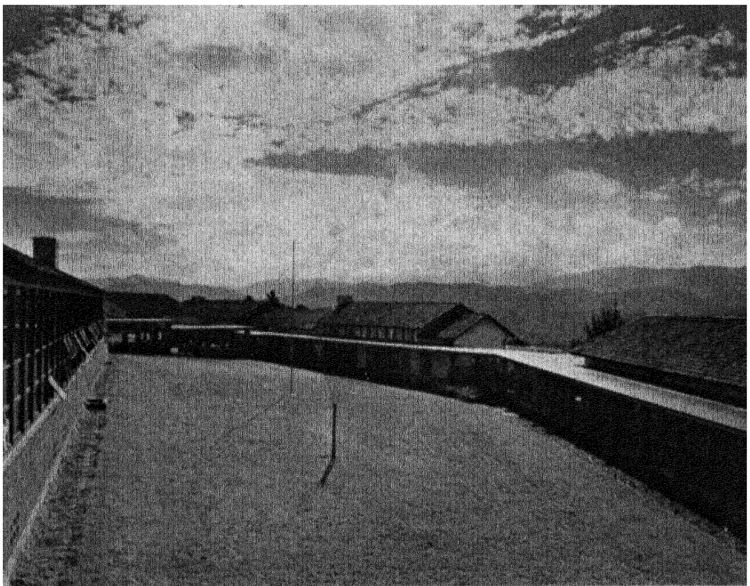


dedicating their abilities to making school buildings places where people love to congregate, places designed especially for their specific activities. Here, then, is a qualitative reason why America needs new school buildings by the thousands upon thousands.

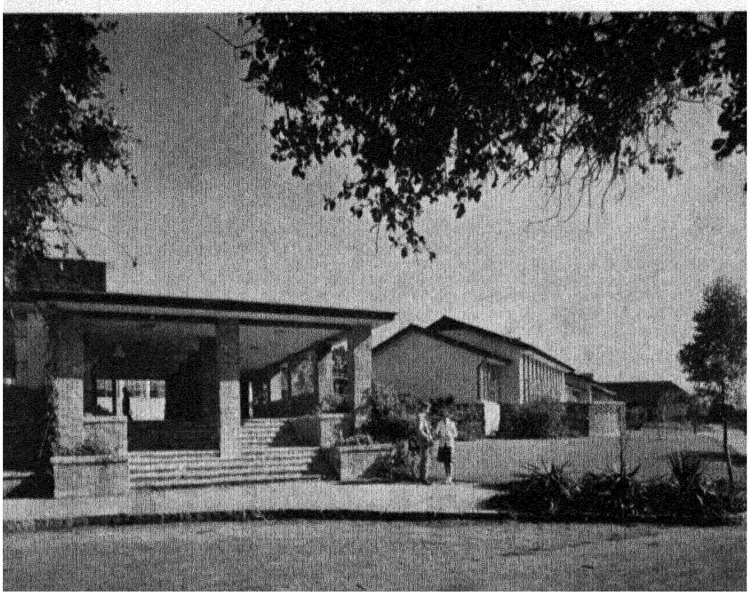
There are other reasons. Many buildings are old and obsolete, not only functionally but physically. They not only cannot be adapted to the expanding needs of new and growing curriculums; they are so tired and worn-out and used up that they are unsatisfactory for any kind of teaching, old or new. They are unhealthful and unsafe. They have to be replaced.

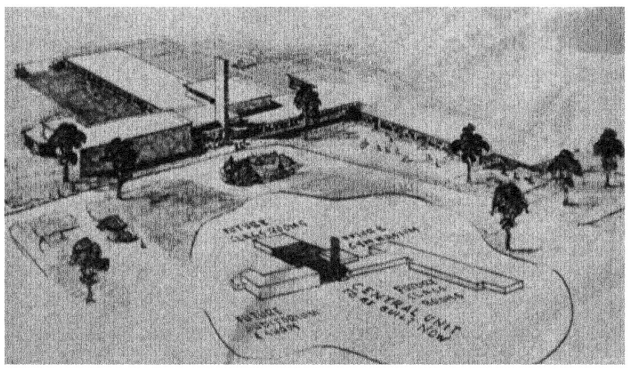
So it happens that across the nation America is faced with the greatest need for new school facilities in its history. And that need is reflected in almost every individual community. Estimates of the amount of money which will be required to provide these facilities are ever upward. For instance, in 1944 it was estimated that $5 billion would buy the nation a new school plant. In 1948 the estimates had risen to $12 or $15 billion. And the end is not yet.

As the nation continues to develop and as new functions are added to the school's job, the need for additional and better educational plants continues. Recognition of this need forecasts a healthy development in our way of life. At the same time, it presents a tremendous challenge to communities, school boards, school officials, architects, and builders to provide facilities not only sufficient in number, but adequate in character to meet the needs of the people better than those needs have ever been met before.



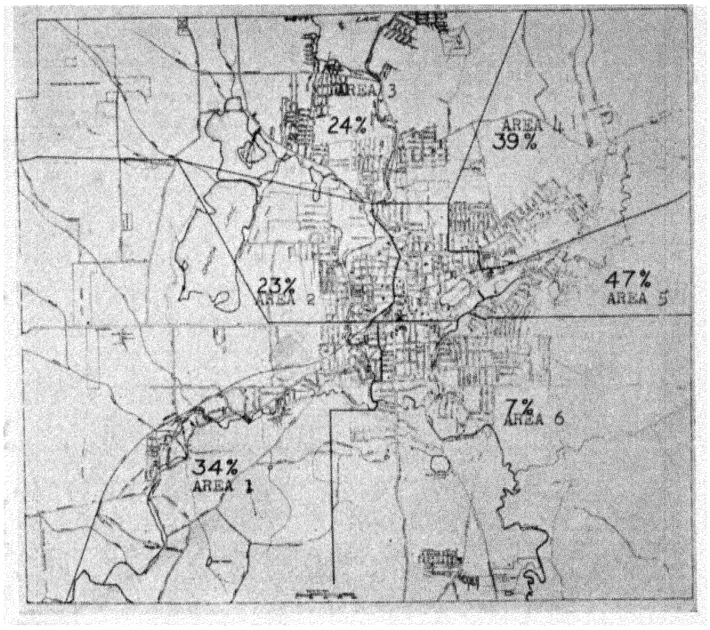
People like to gather in a modern, attractive school which is designed for activities. Carmel High School, Carmel by-the-Sea, Cal. E. Kump, architect.

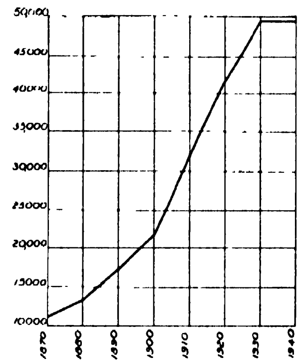




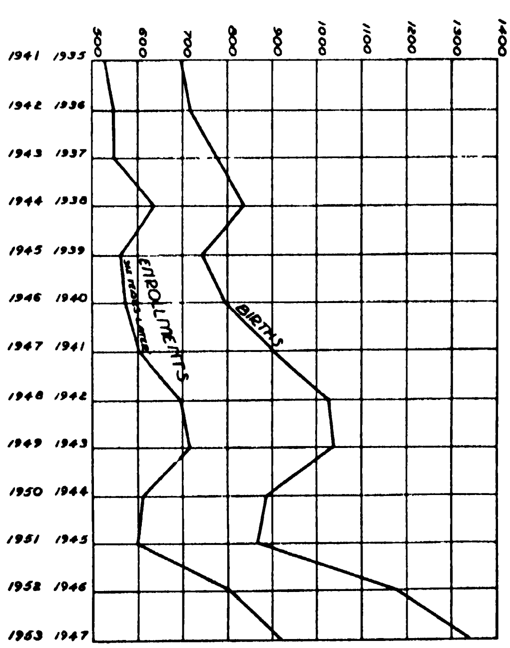
Schools built with a relatively small central unit at this time can fill the growing demand for additional school plant facilities, but plans should be broad enough for their future development and expansion. Proposed Creve Coeur School, Ill. Perkins & Will and Carter E. Hewitt architects. Hedrich-Blessing photo.

CHAPTER 11: Information Needed to Plan and Design a Plant





Census figures get out of date fast. Significant increases in births are found—and plotted to help plan schools. Here in Pittsfield, Mass. we see the increase in numbers of births as indicated by the percentage 1947 based on 1942 births in six areas. The sharp, vertical climb indicated by the line graph shows the growth of the total population in Pittsfield from 1870-1940. Below: The relation of the numbers of births to the number of six year old children in public school six years later is plotted for Pittsfield. Survey made by Engelhardt, Engelhardt and Leggett.



In planning a new school or a long-range program involving several schools, the first thing to go after is information. Several kinds of it. Lots of it. There's no danger of getting too much, for the more information that is acquired pertinent to the planning, the more interest, understanding and good will are developed among the people of the community. When the data are gathered, analyzed and interpreted properly, then only will the form, the design of the plan start taking shape.

Much information is readily available in printed form. It consists of figures which are called facts. These should be used, but they must not be relied on entirely because printed figures are static. They most likely are out of date. And projections from them may often be inaccurate. For example, U. S. census figures change every 10 years, but the population of the country changes every few seconds, increases by delta x million a year. This change in statistics goes on at varying rates in each community, some plus and some minus. It means applying a heavy overlay of good common sense and judgment to the conclusions that the figures indicate.

Here are some of the important questions the information must answer:

(1) *What is the need for today?* Do not stop here. This is obviously one of the most important questions to be answered, but its answers must take their places along with others in any wise scheme of long-range planning.

(2) *What are the best analyses of the needs for 10 years from now? 20? 30?* Answering this will involve a certain amount of speculation. In some quarters this is called gambling. Whatever the term, the odds on winning

increase in direct proportion to the information available.

(3) *What are the curricular needs?* Many a school building in relatively decent physical condition has been outmoded because it simply could not supply facilities for changes in subjects taught and methods of teaching.

(4) *How extensively will the school be used for community activities?* More and more taxpayers are realizing that a school building, or system, can function delightfully and profitably after hours.

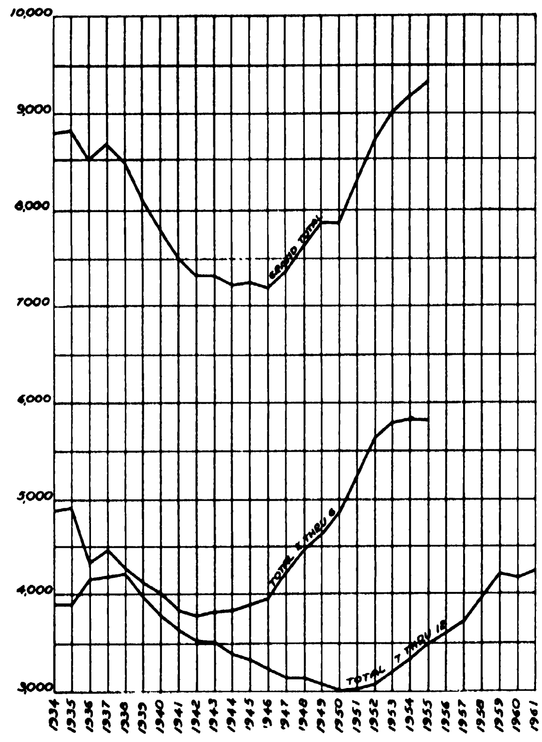
(5) *What are the areas to be served? Do their boundaries need changing?* The answer to this one, of course, is bound up with the answers to questions about present and future needs, and to the one which follows—that ever present question of finance.

(6) *What is the financial condition? How much can the community afford? How much will the community afford?*

Is there a need? Is it certain? Setting up extra desks in the classroom aisles is evidence of overcrowding, but it does not prove the need for extra classroom space. It may be that the boundary of the Washington School should be moved a block toward the Lincoln to equalize the load. It may be—and only an absolutely current school census can give the answer to this—that there is overcrowding only in this age group, a temporary matter.

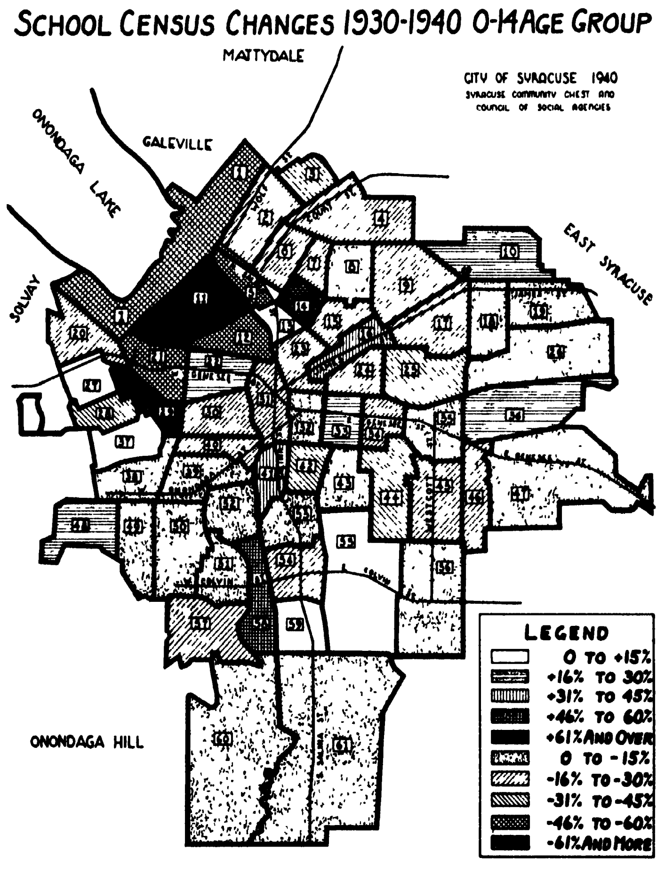
Thus, the community faced with a school plant problem should determine early whether the present attendance area and administrative areas are efficient as to physical size, school population and financial ability. If studies show that they are not, changes are indicated. An example of these changes is the consolidation of several school districts into one in rural areas. Such centralization has proved to result in better facilities, better teachers, better education. It can bring together enough children and enough resources to provide specialists for the teaching of special subjects: so that Johnny and Mary may learn how to paint a landscape, make a bookcase, design a dress, sight-read a lullaby or toot a flute.

In contrast, in thickly populated communities the facts gathered may show that two schools or more should serve where one now staggers under its load. To settle this question answers to others must be found. How many children are there in each age group and in what grades? What is the pre-school population? What residential and industrial building is contemplated for the neighborhood



The public school membership is indicated in this graph as of October 1, 1934 to 1948 with estimates for 1949 to 1961 for Pittsfield.

Cities change. A survey of the changes in child population helps show trends—which help plan schools.



occupations of female residents

Occupation	Camp Hill Borough	East Penns-boro Twp.	Fairview Township	Hampden Township	Lemoyne Borough	Lower Allen Township	New Cumber-land Borough	Wormleysburg Borough	Total Entire Area
I. Professional & Managerial									
A. Professional	48	21	5	7	16	5	41	14	157
B. Semi-Professional	1	—	—	—	1	1	—	—	3
C. Managerial & Official	15	—	—	—	—	1	2	5	23
Total	64	21	5	7	17	7	43	19	183
*% this classification	19.81	25.61	22.73	19.44	9.66	14 0	16 8	16.10	17.22
II. Clerical and Sales									
A. Clerical and Kindred	235	54	16	15	90	16	162	64	652
B. Sales and Kindred	4	—	—	3	2	—	3	13	25
Total	239	54	16	18	92	16	165	77	677
% this classification	73.99	65.85	72.73	50.00	52.27	32.00	64.45	65.25	63.69
III. Service Occupations									
A. Domestic Service	—	1	—	8	56	26	12	13	116
B. Personal Service	15	6	1	2	6	—	6	2	38
C. Protective Service	—	—	—	—	—	—	—	—	—
D. Building Service, Etc.	—	—	—	—	—	—	—	—	—
Total	15	7	1	10	62	26	18	15	154
% this classification	4.64	8.54	4.55	27.77	35.23	52.00	7.03	12.71	14.49
IV. Agriculture, Forestry, etc.	—	—	—	—	—	—	—	—	—
% this classification	—	—	—	—	—	—	—	—	—
V. Skilled Occupations	4	—	—	1	4	1	8	2	20
% this classification	1.23	—	—	2.78	2.27	2.00	3.12	1.69	1.88
VI. Semi-Skilled Occupations	—	—	—	—	1	—	6	5	12
% this classification	—	—	—	—	.57	—	2.34	4.24	1.13
VII. Unskilled Occupations	1	—	—	—	—	—	16	—	17
% this classification	.3	—	—	—	—	—	6.25	—	1.6
Totals	323 100%	82 100%	22 100%	36 100%	176 100%	50 100%	256 100%	118 100%	1063 100%

* Read as follows: Percentage of all employed females of this school district who fall under this employment classification.

The Pennsylvania Economy League, Inc. helped one district examine itself. How people make a living is important to the school program and plant.

industries of the area

Industries	Number and Location								
	Camp Hill	East Penns-boro Township	Fairview Township	Hampden Township	Lemoyne	Lower Allen Township	New Cumberland	Wormleysburg	Total
1. Chemical and Allied Products		2							2
2. Clay, Glass and Stone Products					2		2		4
3. Food and Kindred Products									
Bread and Baking					2	1			3
Cheese					1				1
Flour						1			1
Grist Mill	1				1				2
Ice Cream					1				1
Ice—Manufactured					1				1
Slaughter and Meat Packing						1			1
Unclassified (A. M. Hess)						1			1
4. Lumber and Its Remanufacture	3				2		1		6
5. Metals and Metal Products	1				3	1			5
6. Mine and Quarry Products						1			1
7. Paper and Printing Industries					2		2		4
8. Textiles and Textile Products					2		3		5
9. Tobacco and Its Products							2		2
10. Miscellaneous Products									
Laundry Work—Cleaning and Dyeing					1				1
Mattress and Bedding					1				1
11. Railroad Repair Shops		4							4
Total	5	6	0	0	19	6	10	0	46

occupations of male residents

Occupation	Camp Hill Borough	East Pennsboro Twp.	Fairview Township	Hampden Township	Lemoyne Borough	Lower Allen Township	New Cumberland Borough	Wormleysburg Borough	Total Entire Area
I. Professional & Managerial									
A. Professional	193	58	17	12	48	22	77	17	444
B. Semi Professional	45	3	4	6	17	4	38	9	126
C. Managerial & Official	290	55	38	38	72	74	168	63	798
Total	528	116	59	56	137	100	283	89	1368
*% this classification	36.69	7.92	7.48	10.45	10.9	12.15	16.95	20.04	16.24
II. Clerical and Sales									
A Clerical and Kindred	262	118	18	33	157	50	293	35	966
B Sales and Kindred	202	32	15	25	253	70	134	25	756
Total	464	150	33	58	410	120	427	60	1722
% this classification	32.24	10.24	4.18	10.82	32.62	14.59	25.57	13.51	20.44
III. Service Occupations									
A. Domestic Service	6	3		--	—	4	9	4	26
B Personal Service	16	21	--	4	10	6	9	7	73
C. Protective Service	28	65	9	3	15	20	41	26	207
D. Building Service, Etc.	12	10	-	1	9	6	4	10	52
Total	62	99	9	8	34	36	63	47	358
% this classification	4.31	6.76	1.14	1.49	2.70	4.37	3.77	10.59	4.25
IV. Agriculture, Forestry, etc	19	40	147	78	10	53	5	6	358
% this classification	1.32	2.73	18.63	14.55	.8	6.44	.3	1.35	4.25
V. Skilled Occupations	125	92	49	51	315	100	177	75	984
% this classification	8.69	6.28	6.21	9.51	25.06	12.15	10.6	16.89	11.68
VI. Semi-Skilled Occupations	160	361	77	75	251	172	395	123	1614
% this classification	11.12	24.64	9.76	13.99	19.97	20.9	23.65	27.70	19.16
VII. Unskilled Occupations	81	607	415	210	100	242	320	42	2019
% this classification	5.63	41.43	52.6	39.18	7.96	29.4	19.16	9.9	23.97
Totals	1439 100%	1465 100%	789 100%	536 100%	1257 100%	823 100%	1670 100%	444 100%	8423 100%

* Read as follows. Percentage of all employed males of this school district who fall under this classification.

population estimates by families

	Families	Percentage of Families in West Shore Area	Persons per Family
1922	27,200	12.0	4.02
1930	31,000	18.5	3.85
1940	35,600	18.6	3.63
1946	39,200	18.8	3.53
1950	42,000	20.6	3.47
1956	46,200	22.7	3.42
1966	51,500	24.6	3.32

Utilities companies are betting on forecasts. From the Community Survey by the Pennsylvania Economy League, Inc. with eight school districts.

estimate of homes to be completed

Development	Date Scheduled for Completion 1948	1949	1950
Highland Park	50	30	30
Highland Estates	40	40	40
College Park	60	70	90
Mutual Life	—	200	200
Keewaydin and Vicinity	50	80	—
Beverly Park	70	50	--
Camp Hill North of 17th	15	—	--
Camp Hill—Scattered	25	15	15
Shiromanstown	10	10	10
Totals	320	495	380

Facts and forecasts get across on a map. From a survey of Bloomington Public Schools. Perkins & Will architects.

which will generate additional school burden? What will be the school population by age groups in subsequent years?

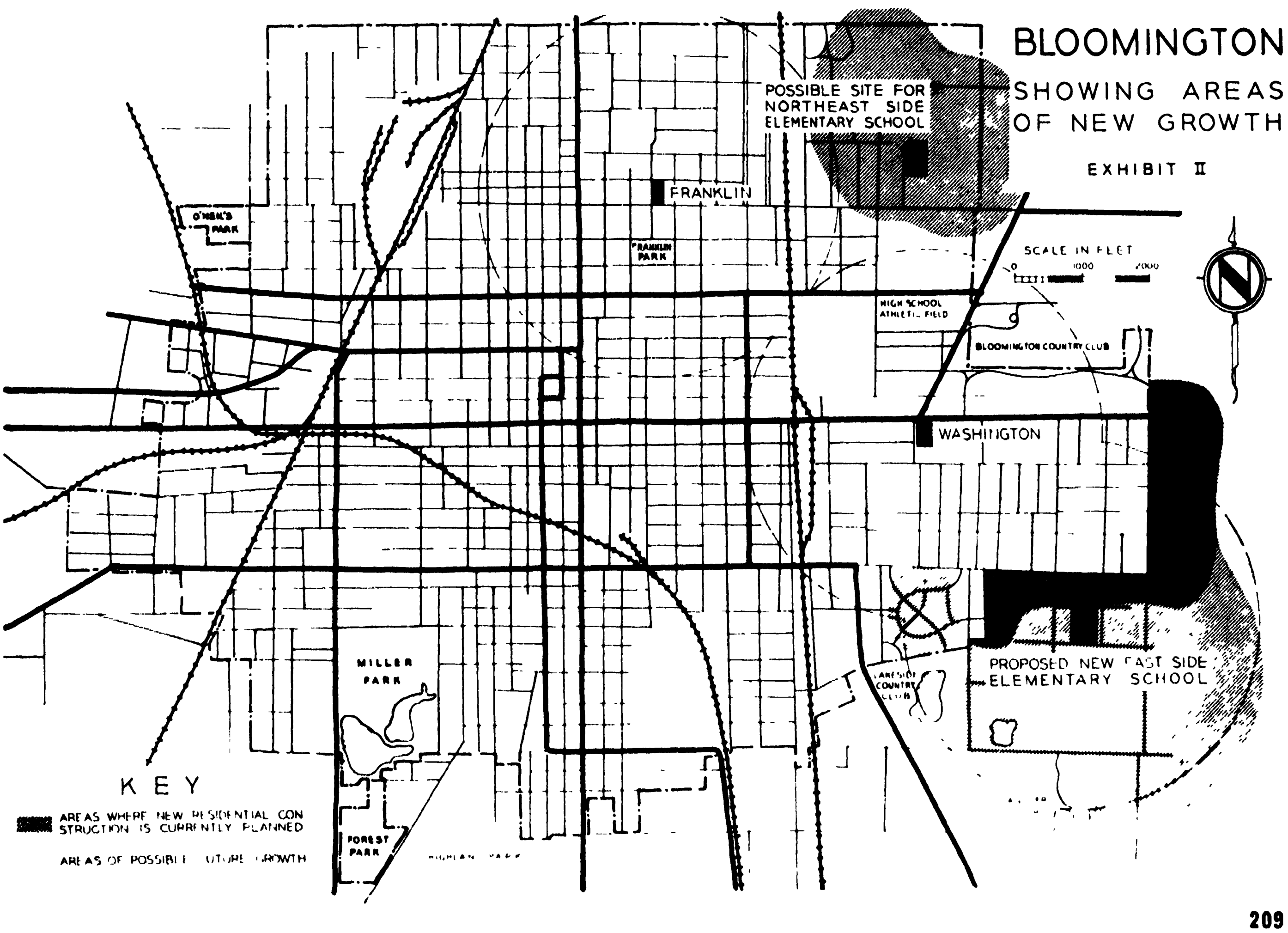
How people live is fully as important as how they make a living. What kinds of homes do they live in? Do they have cars, telephones, good sewage disposal, running water, electricity? How strong is the family? How big is it? What are the trends and predictable future in homes; what goes on in them; and what facilities have they? Housing studies may be available. Sampling-type socio-economic status surveys yield helpful information. Social and welfare organizations as well as commercial houses may already have much of this information. How people live, how they want to live, and how they hope to be living certainly are determining factors in what their schools do.

A good source of information is the meter reader. That is no idle jest. Utility companies who are serving the community are betting dollars every day on data which they keep up to date in their own self-interest—information on current population and population trends—who lives where and how many and where are they moving to? The established fashion in utility executives calls for civic cooperation of a high and intelligent order. This source should not be slighted in the interest of a good school plant.

Real estate boards, assessors, and public transportation companies will have studied trends and probable areas of future development. Highway departments, too—local, county, and state—will have such studies. These estimates of trends together often help make trends. Hence their information is worth collecting and studying. Maps may be the best means of presenting such data.

Community welfare services—governmental and private—have a place in a community survey. What are they, where are they, whom do they serve? Where are the parks and what are the plans for parks? What about recreation? Health services? Hospitals? The list is as long as need, interest and ability to support these facilities has allowed it to grow. Each such agency is a partner in community-serving. Each has important information and is eager to contribute it. All will help determine and locate unmet needs.

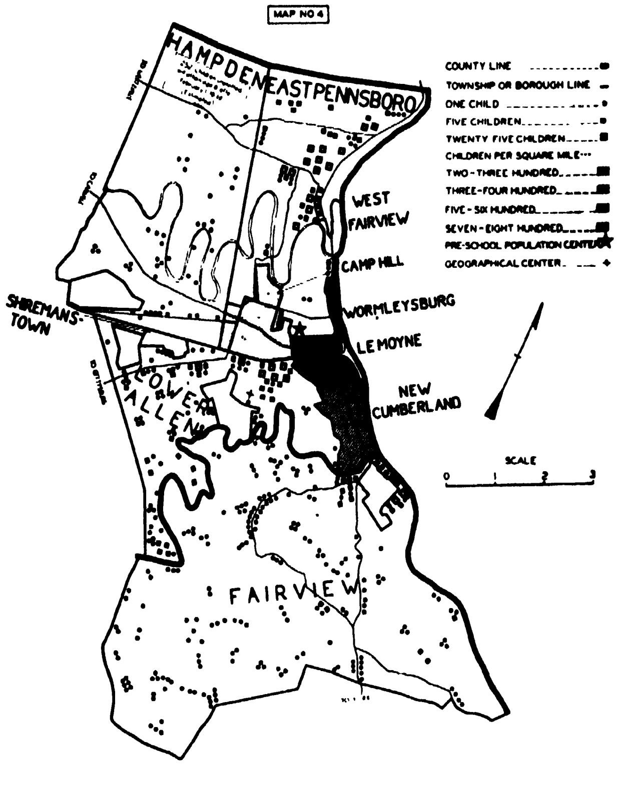
A map, like a picture, *can be* worth 10,000 words. It can make figures vivid and data more understandable. These maps can be prepared with appropriate symbols showing location of children by age groups from information gathered by ordinary house to house school census methods. Better yet, the children themselves can take part in planning the



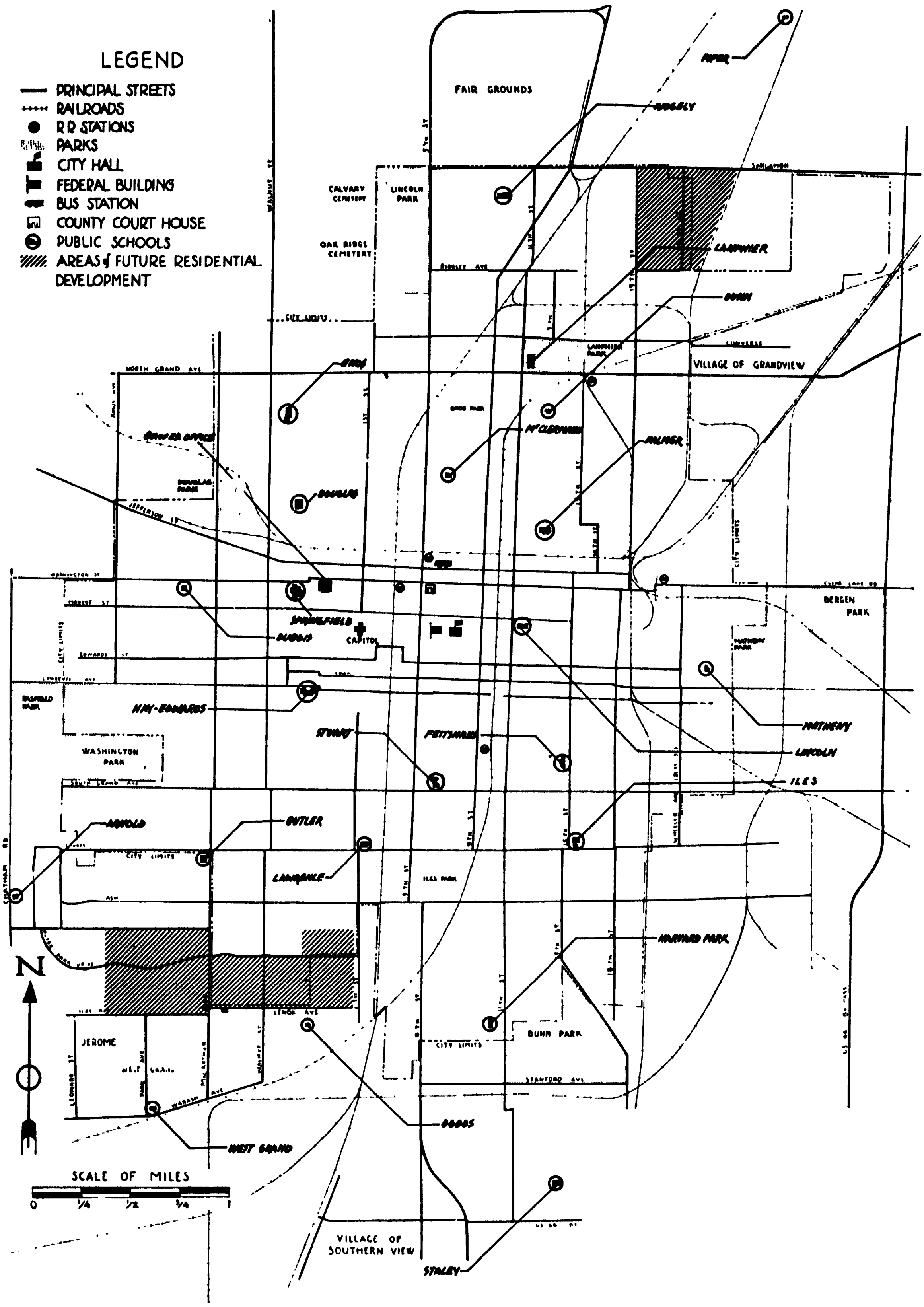
school they are going to use. The figures which show who the children are, where they are, how old they are, can be reduced to pins on a map with each color representing an age group. A method for producing such a map quickly is to have the map sent around to the various rooms in each school and have each child come forward and put his pin at his house. This is particularly valuable if the parochial children will help by doing it, too. It is even better when the children as partners in the venture survey their own particular neighborhoods, checking omissions, making additions. The end product is a quickly achieved map of the distribution of the children, and each child an interested participant in its creation.

This is by no means the only map needed. Areas of growth and decline can be mapped. Physical barriers which influence the divisions of an administrative area can come to life when presented on a map. Maps show needed changes in area boundaries better than any other means and certainly dramatize the relationship of school plant to the community it serves. Maps can show traffic density and flow, which will translate into locating schools where the fewest people will have to cross dangerous streets. The data, if pursued far enough, will inevitably lead to producing the school's important component of community planning. Little children are not expected to walk as far as big ones. For instance, authorities have suggested a quarter-mile radius for kindergarten, an outside limit of three-quarters of a mile for the intermediate and upper elementary grades, a mile and a half maximum travel for the junior high school, and up to three miles for high school students. This can be mapped with very pretty looking circles. More valuable still will be the map that shows in addition the heavily traveled traffic arteries, and other obstacles. The existence and growing importance of the school bus and other public transportation must be a factor in evaluating such maps.

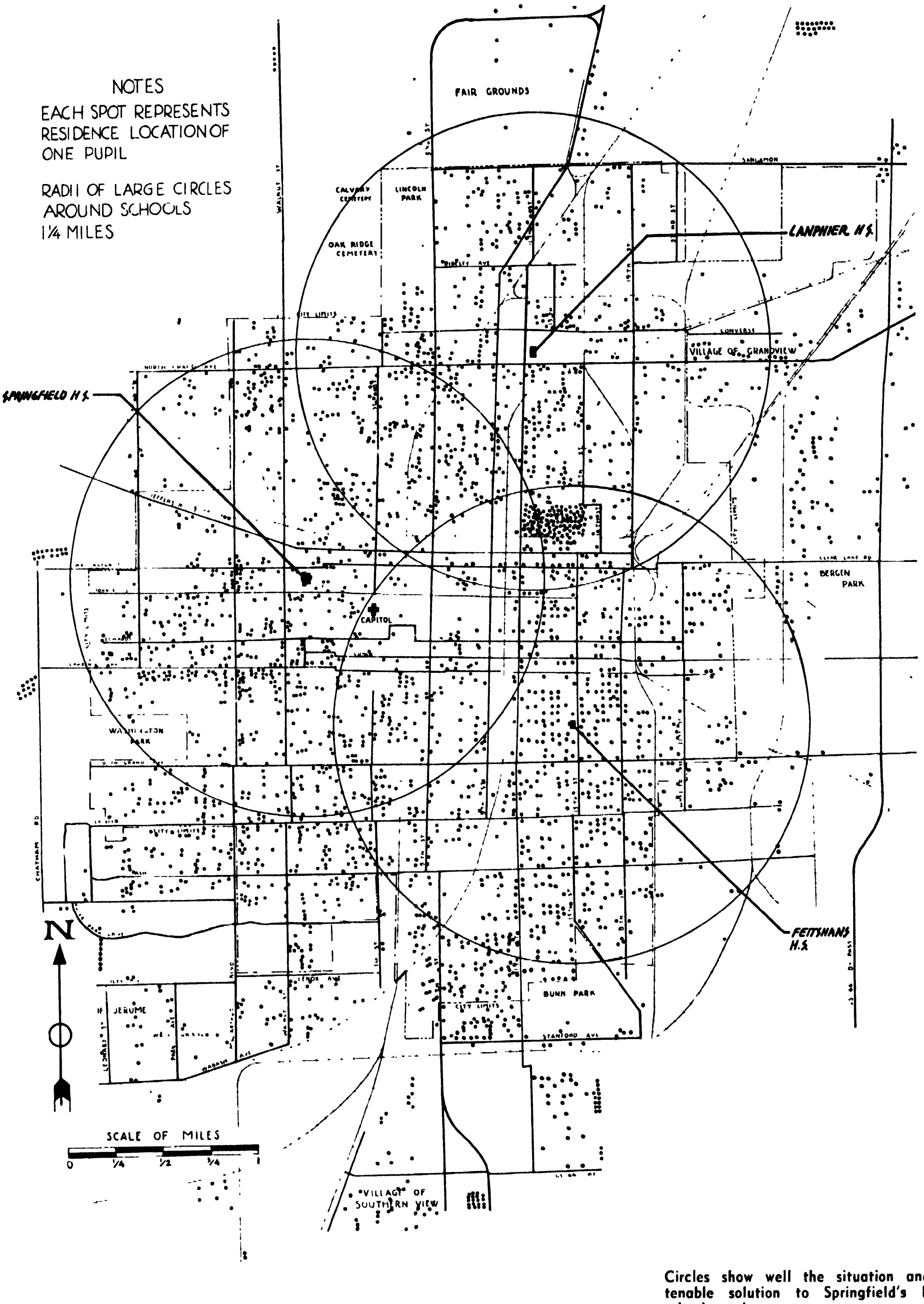
A map can make data more understandable. The Pennsylvania Economy League, Inc. shows where tomorrow's school children live.



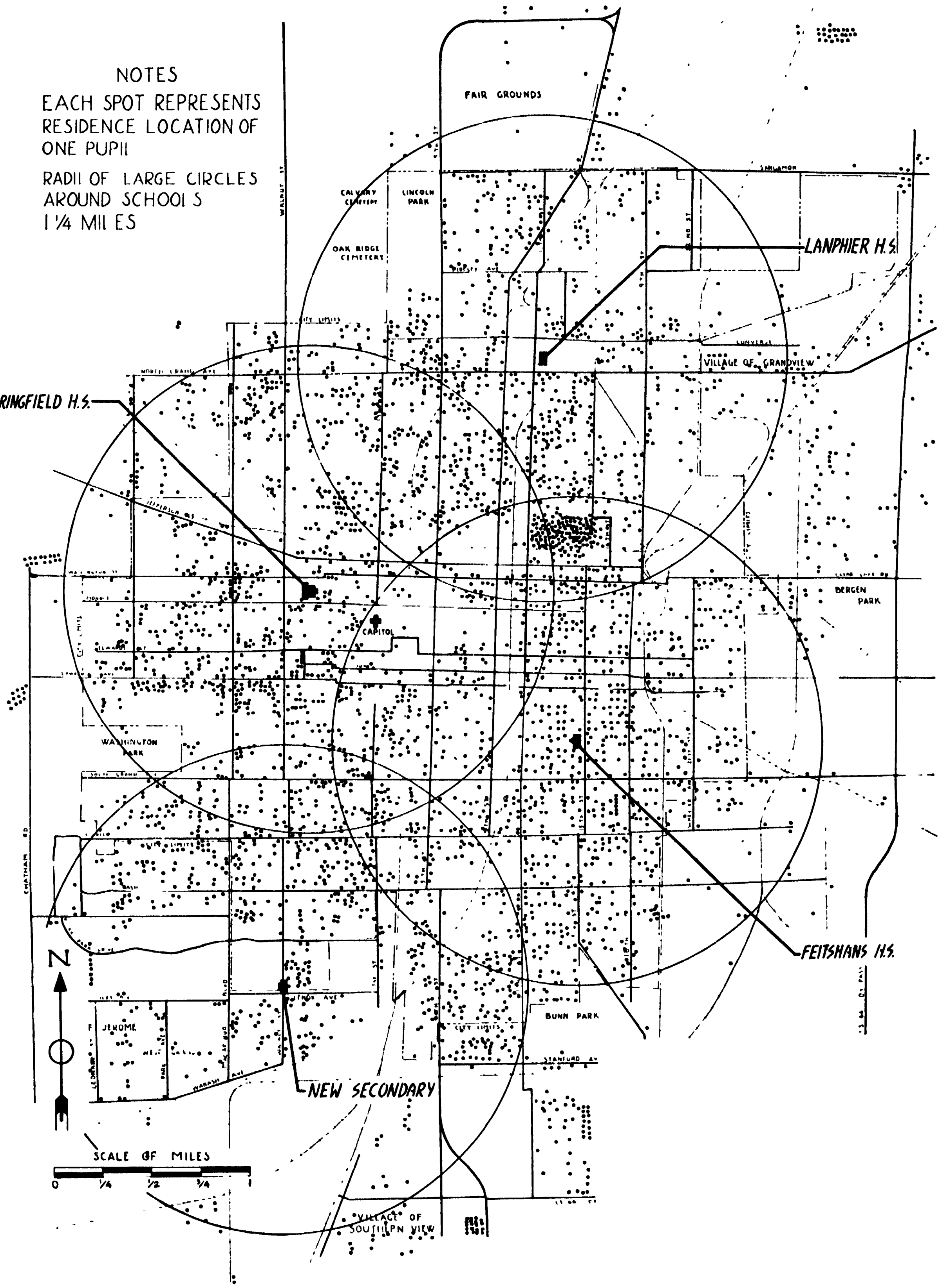
The plant-that-is must be examined with a cool and calculating eye. How does it measure up to the job it ought to do? There are score cards available—that of Dr. Holy of Ohio is an excellent example—to measure the existing school plant by some nationally accepted standards. Such standards are invaluable, but not yardstick enough. The needs, wants, program of the local school provide refinements in the measuring stick. Local standards may be higher, certainly are different in this school plant. National standards are helpful



A map showing physical features helped Director John H. Herrich, Springfield, Ill., study building needs.



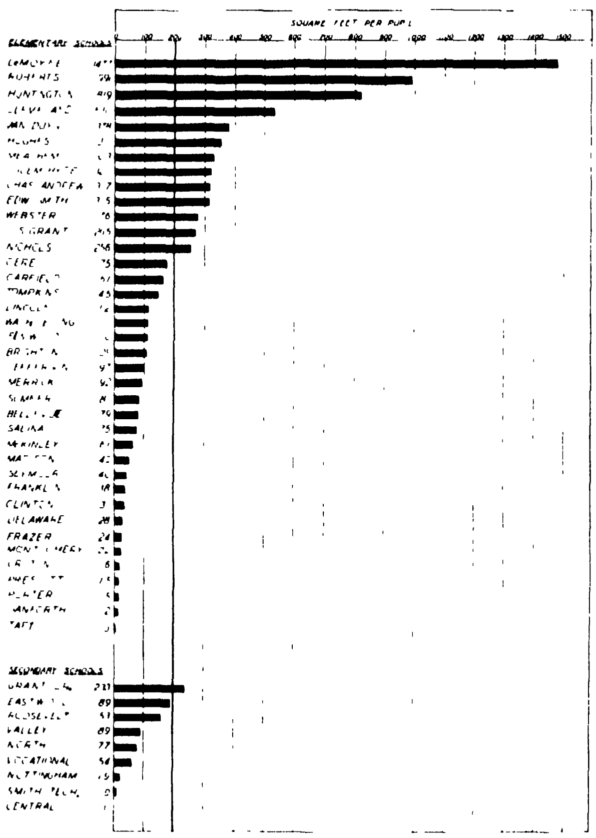
Circles show well the situation and a tenable solution to Springfield's high school needs.


NOTES
EACH SPOT REPRESENTS
RESIDENCE LOCATION OF
ONE PUPIL
RADII OF LARGE CIRCLES
AROUND SCHOOLS
1 1/4 MILES
FAIR GROUNDS
CALVARY CEMETERY
LINCOLN PARK
OAK RIDGE CEMETERY
LANPHIER H.S.
VILLAGE OF GRANDVIEW
SPRINGFIELD H.S.
BERGEN PARK
CAPITOL
WASHINGTON PARK
FEITSHANS H.S.
BUNN PARK
JEROME
NEW SECONDARY
N
SCALE OF MILES
0
1/4
1/2
3/4
1
VILLAGE OF SOUTHERN VIEW

Name Of School	Year Built	Grades Taught	1946 Enrollment	Area — Site — Acres	Sq. Ft Per Child	Children Per Room	Lighting Intensity	Toilet Facilities	Class Rooms	Kindergarten	Lunch Rooms	Special Purpose Rooms	Gymnasium	Auditorium	Library	Health Room	Holy-Arnold Score
Bloomington H.S.	'15	9-12	1120	15.9 1.79	620 69	19											511
Irving J.H.	'04	K-8	459	1.53	145	24											426 524
Bent J.H.	'24	K-8	395	1.46	162	23											504 573
Washington J.H.	'05 '26 '40	K-8	514	1.32	112	25											499 544
Emerson	'06	K-6	190	1.84	422	21											447
Lincoln	'34	K-6	191	1.29	294	24											645
Franklin	'99	K-6	230	1.08	204	29											496
Edwards	'05	K-6	272	1.11	179	25											502
Jefferson	'32	K-6	245	1.0	179	30											568
Raymond	'31	K-6	233	1.64	309	29											649
Sheridan	'34	K-6	223	1.24	241	28											644

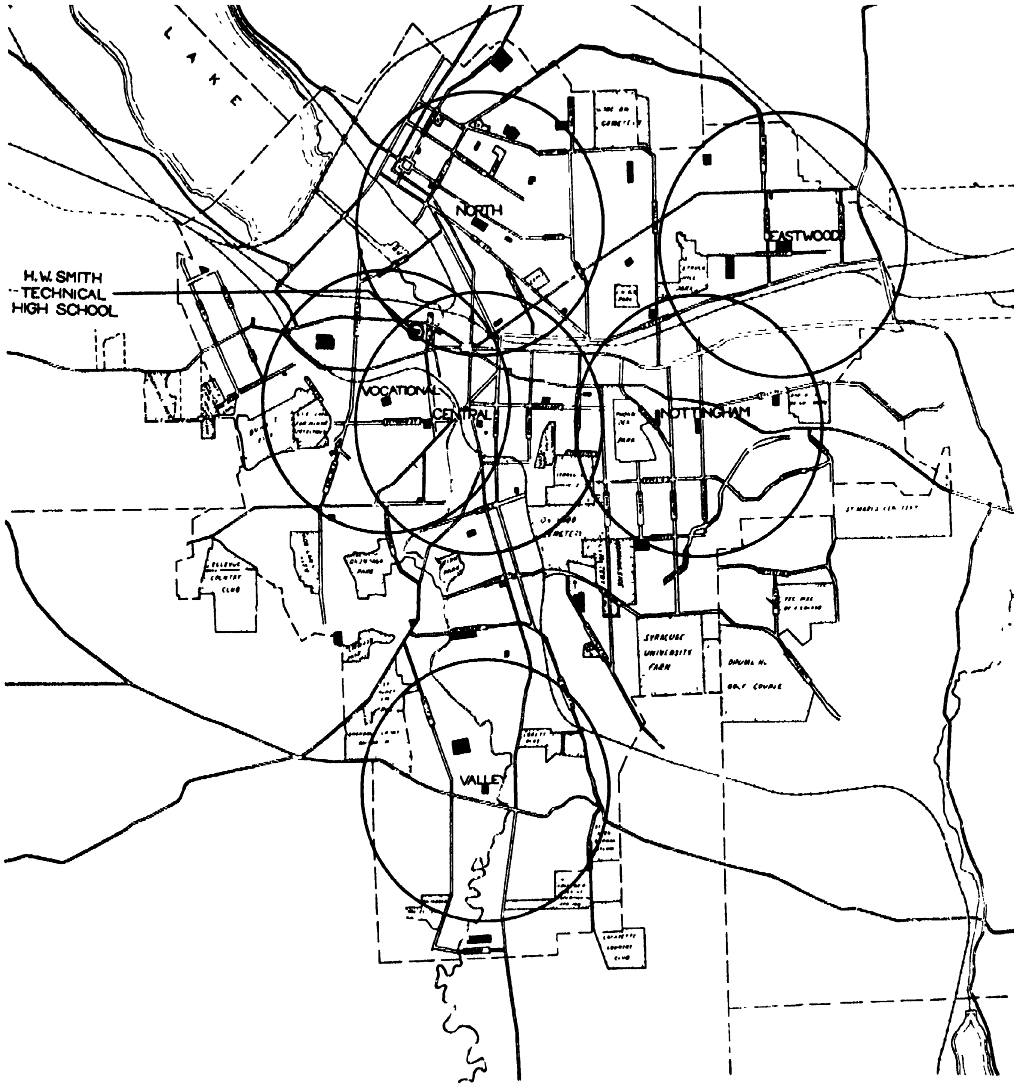
= Good = Fair = Unsatisfactory | In The Holy Arnold Scoring System The Score Of 1000 Is Ideal

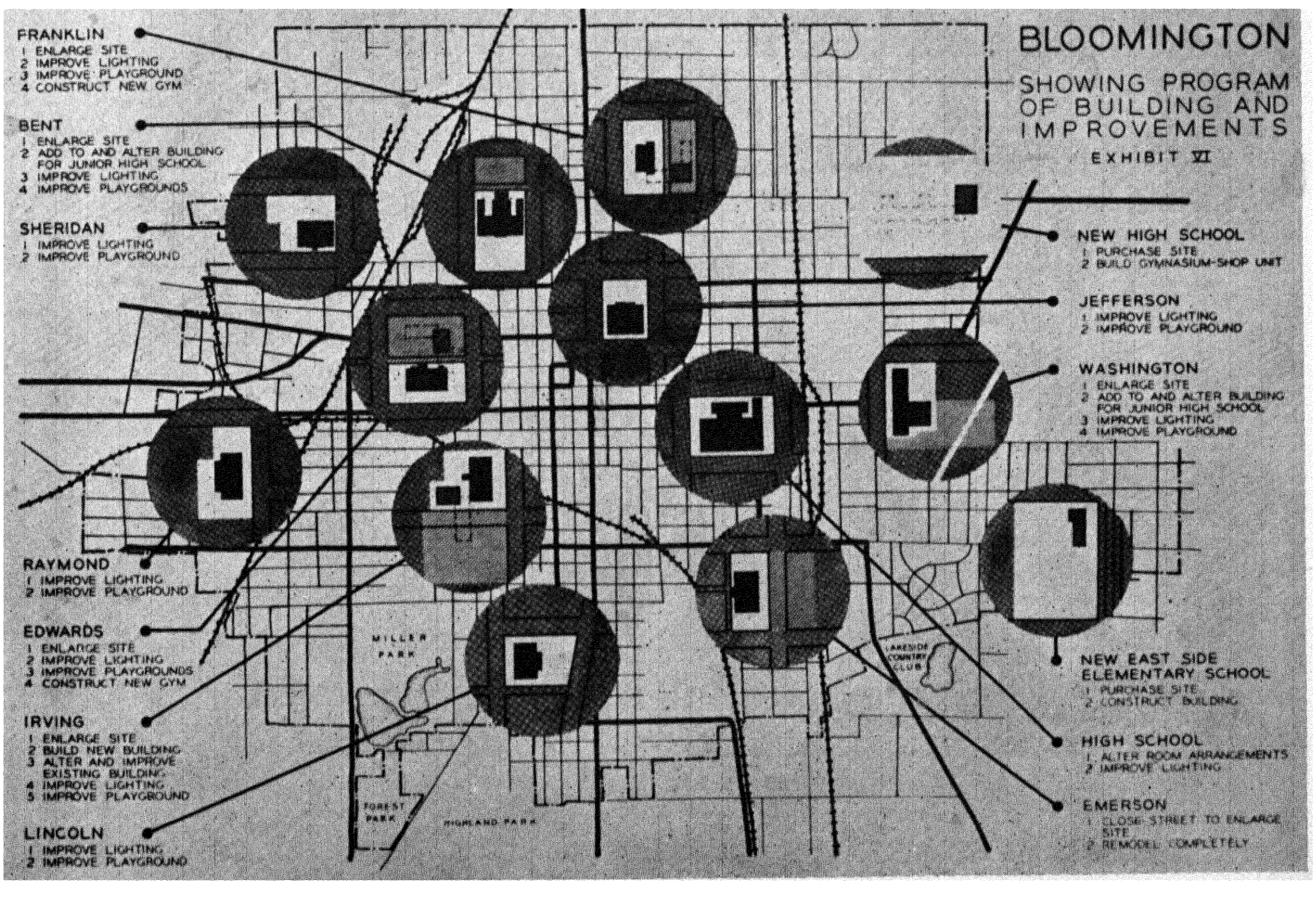
"The plant-that-is must be examined with a cool and calculating eye"—and the findings summarized for easy understanding From a survey of the Bloomington, Ill School. Perkins & Will architects.



The Syracuse Survey (Harry P. Smith and T. C. Holy) turned up an amazing variation in play space available at the schools A bar graph tells the story.

Building and improvements program in a typical town. At right: Surveys such as this of Syracuse, N. Y., senior high school buildings are necessary to an architect's understanding of the total school-housing problem. Below: This shows the program of building and improvements in Bloomington, Ill.





Standards for clothing issue in the army—averages—help the Q.M. in planning, but individual measurements are what makes them fit!

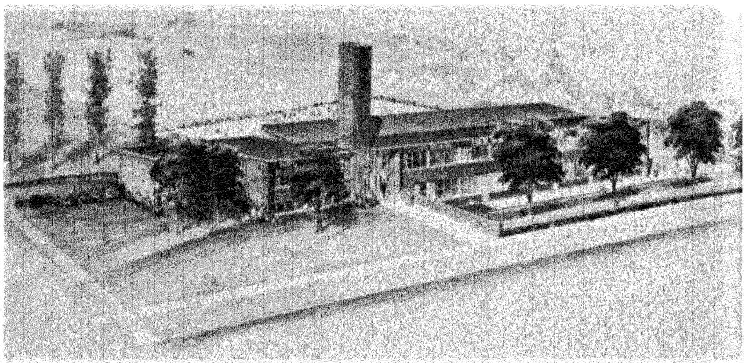
A few standards are universal. Safety is unarguable. Sanitation is here to stay. Their application in the scoring of buildings and sites involves mechanical and structural special knowledge. At least equally, however, there must be a philosophy and educational policy against which to measure.

Each local score card should include its own standards. A good hospital or clinic near the center of town will affect the health program. A poor system of parks and playgrounds will add need for school site recreation. A hilly terrain will shorten convenient travel distances. In Gotrocks Hills the distances are small and no child ever walks three blocks. He is driven. In most communities he walks, or bicycles, or rides a bus.

There are needs other than those expressed in terms of census statistics and geography. Needs such as the organic requirements of the curriculum. What is the school's method of teaching? What will it need in terms of room, plant, and equipment?

The function of a school is to improve the quality of living in the community of which it is a part. Perhaps that has always been the school's function. But nowadays there are new and better ways of going about it. Time was when learning was apparently emphasized for learning's sake alone. The learning was supposed to transfer itself from the printed book into the plastic mind, as though by osmosis, aided occasionally by the catalytic action of the birch. Later, the growth and development of the child—the mind, the body, the personality—was stressed as the fundamental school job. Later still, emphasis has been placed on using the school for the education not only of the child but also of the adult, on the theory that education—or at least the opportunity for it—should never cease. Any one or all of these separate attitudes toward education can undoubtedly aid the improvement of living in a community. But each community's attitude and each community's school program should grow out of a thorough study of its own specific individual needs.

Roughly, the educational program of most schools is composed of two major parts: (a) its program for children of a certain age group, and (b) its program of community services. An over-simplified way of stating this would be to say that the instructional program is good because it teaches people to read, since people who cannot read do not make a good community. As a community



What sort of modern building is needed in your community to improve the quality of living? Perkins & Will architects. Hedrich-Blessing photo.

School plants must be designed to meet the needs of children and to provide a program of services to the community. West Side Elementary School, Northbrook, Ill. Perkins & Will architects. Hedrich-Blessing photo.

service the school may provide recreation and adult education for adults, since people who do not keep up their health and their understanding do not make good citizens.

The big questions to answer then are (a) how will the school provide for its children, and (b) what will it provide for its community?

In one large city, the sea provides a livelihood for most of the community. The educational program as a result has been developed to aid in understanding life on the sea, to learning how to make a living on the sea, and to relating that kind of life to other ways of making a living. In the planning of a new building for that community, the educational officials selected a site on the water. An important part of the plant facilities is, in fact, a ship. And unique equipment is installed for the study of maritime life. Thus the entire plant is shaped by the nature of the educational program.

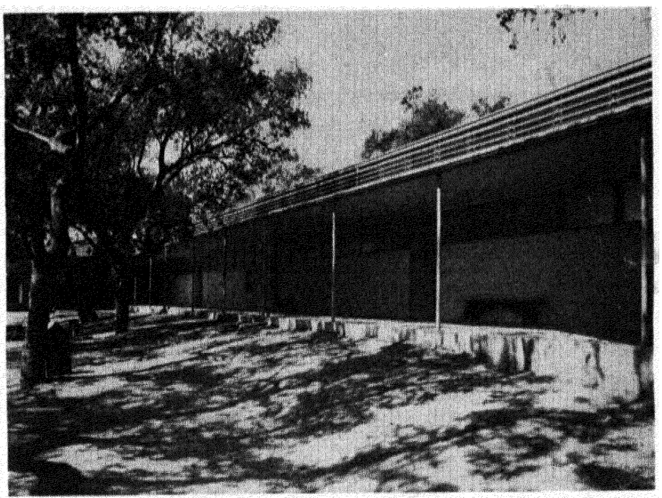
Down in the Deep South cotton country, in a community suffering from the economic hangover of a one-crop system, diversification in agriculture was decided on as the keynote for a new school program. This meant educating farm youth in livestock husbandry, and the growing of grains and vegetable crops. Thus the new school plant included dairy barns, a slaughtering house, a cannery, a quick-freezing unit, ample plots for diversified crop cultivation—all this plus facilities for teaching reading, art, music, and business courses.

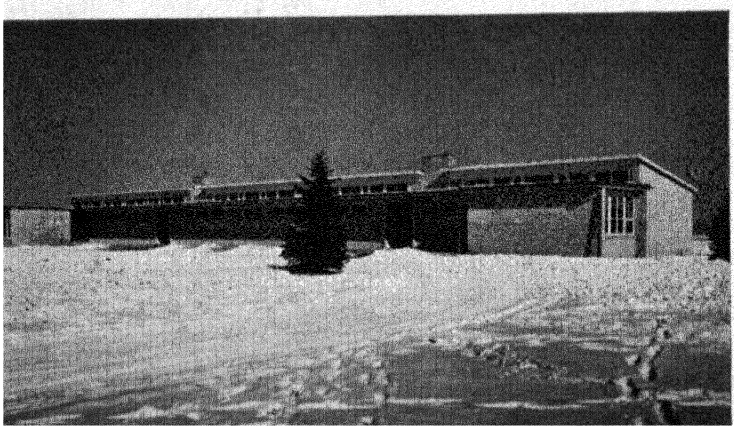
Whatever the method of instruction, the elementary school will undoubtedly include the teaching of reading, writing, and arithmetic; some elementary science; music and art; some smattering of information about the present and the past of the world we live in; plus experience in making things. At the secondary school level the knowledge of the three R's will be deepened by practical application. Greater emphasis will be placed on development of vocational skills and understanding of society.

These ends can be approached by the old method, requiring mainly plenty of books and proper behavior. Or their pursuit can be made infinitely more interesting by the experience method — learning by doing. The method is part of the educational program. As such it greatly influences the plan of the school plant—the spaces and the facilities needed.

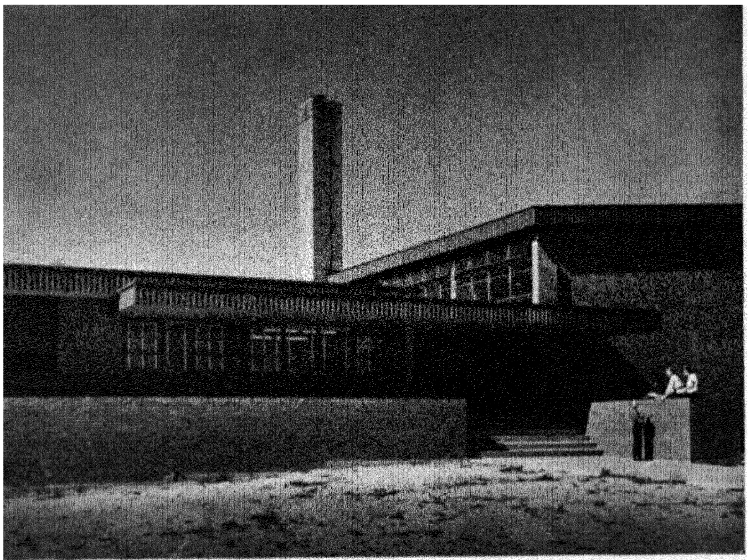
Furthermore, the design of the school will be greatly influenced by the extent of the services it renders to the community as a whole. The school can be merely a place for

The organization of the school program affects planning. La Canada School. H. L. Gogerty architect.

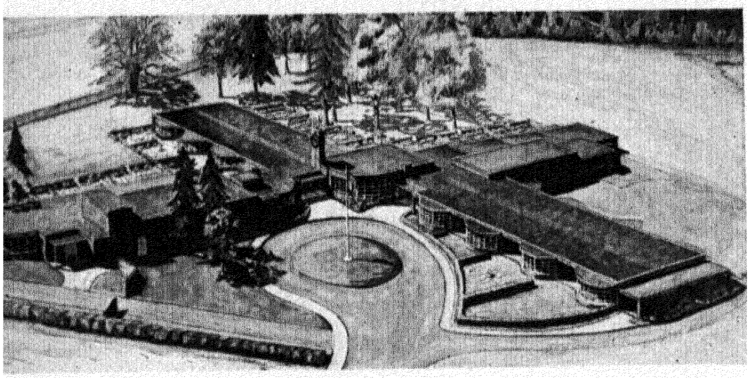




What type of school will help develop the resources of your community? Perkins & Will architects. Hedrich-Blessing photo.

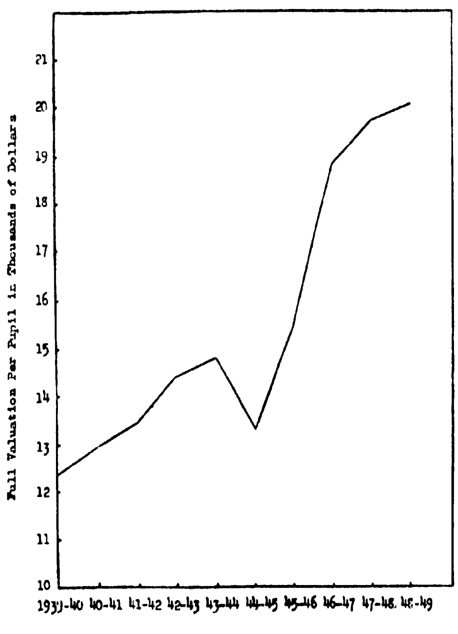


Schools are built for educational programs, so why not utilize the group of people using the facilities the most—the children—in planning. Grayslake High School. Ganster & Hennighausen architects. Snazelle photo.



Schools must be designed for activity programs. Edgemoor Road Elementary School, Mt. Pleasant Special School District, Del. Robinson, Stanhope, and Manning architects.

Director John H. Herrich shows the increasing ability of Springfield's real property to support a strong school program.



instruction, or it can provide recreational facilities, places to eat, places to meet, places to sew and play bridge and knit and make cabinets and act in plays.

So define the program; then build to house it.

In defining that program, it is well to know not only the statistical facts about the community, but those intangibles that have to do with its own unique personality. Each community differs from every other in some respect. But every community has the same categories of resources that go to make up its personality: (1) human resources, (2) social organizations, (3) natural or physical resources.

If the school's job is helping to improve the quality of living, then it does its work by helping to develop its community's resources. Those concerned with planning a new school plant, then, must know those resources, the need for their development, ways of doing it.

What is secured in the way of information is one thing; how that information is gathered is another. The methods of piling up data can be made exciting, and the information and its interpretation are vastly more valuable when the people of the community are enlisted in the project. The youngsters themselves can help, as mentioned previously. The teachers, of course, can be invaluable, and everyone else in the community can pitch in and dig for information—P.T.A., women's clubs, men's luncheon clubs, church groups, Boy and Girl Scout organizations, 4-H clubs, labor unions, etc.

Out in California's fruit-rich San Joaquin Valley, the city of Fresno faced the problem of school expansion. It was a big problem, and it required immediate action. The board of education took the problem to the people, asked for help, got it, and got a vigorous new school program with everybody happy.

Population in Fresno had zoomed during World War II—school enrollment up more than 60 percent. And it kept on climbing, its rise accelerated by new multi-million dollar flood control and irrigation projects nearby. Crowded classrooms had reached the standing-room-only stage. It was an emergency.

So the Fresno Board of Education appointed a committee of 150 citizens to help dig up information, help analyze it, help interpret it to the public.

Working with the citizen's committees and community agencies, Fresno architects David Horn and Rafael Lake prepared a report on what was needed and how much it would cost—for new sites, new buildings, modernization of old facilities.

table of assessed valuation roll, bonded indebtedness and debt service costs in Union Free School District #1, Town of Scarsdale,—at 5-year intervals. June 17, 1949

	Assessed Valuation For Sept. 1 Tax	Bonds Outstanding July 1	% of Assessed Val.	Debt. Serv. in Budget Year	Tax Rate Per 1,000. for Debt Ser.
1914	$ 5,625,650.	$ 26,000.	0.46%	$ 1,040.	$0.18
1919	8,867,922.	296,000.	3.33%	27,090.	3.00
1924	21,428,862.	823,500.	3.84%	71,752.	3 30
1929	46,087,270.	2,317,000.	5.02%	146,869.	3.10
1934	63,308,312.	2,850,500.	4.50%	190,490.	3.00
1937	(Peak)	3,508,500.	5.48%	—	
1939	66,087,338.	3,337,500.	5.05%	253,254	3.80
1944	61,234,093.	2,709,500.	4.40%	255,411.	4.10
1949	64,526,444.	2,014,500.	3.12%	248,834.	3.80
1954	—	1,160,500.	—	211,212.	—
1959	—	517,500.	—	94,992.	—
1964	—	152,500.	—	39,772.	—
1968	—	25,000.	—	26,125.	—

A table shows present ability and past willingness to support a building program.

The final proposition which went before the voters was a bond issue for $4,500,000. It represented the cost of a plan which would relieve overcrowding without further delay, and at the same time improve existing facilities up to decent standards.

Then came the real proof of the value of all-community participation in school program planning. The citizen's committee, having assembled the information and produced the plan, went to work to put it over the firing, or voting, line. Churches, lodges, other organizations—the very people who had helped *amass* information—went to work to *dispense* information. Publicity sub-committees saw to it that all Fresno learned about the desperate need for new schools, and how the proposed bond issue would satisfy that need.

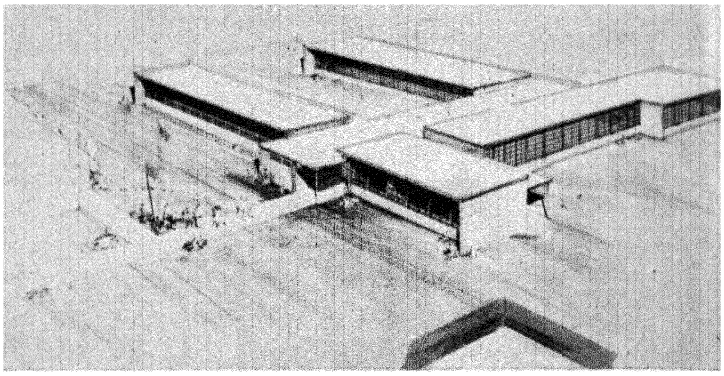
The bonds for the secondary schools carried by six and one-half to one. The bonds for the elementary schools carried by eight to one.

The case of Fresno is cited not because it is dramatically different, but because it is so dramatically typical. From Passamaquoddy to Pomona communities are learning the value of such cooperative efforts in getting information, in understanding it, in doing something right about it.

When all the precincts are heard from, when all information is in, then and only then should the physical planning start. The facts should give a well rounded picture of the scope and character of the educational program; the needs and culture of the community; the population and its trends; environmental factors; climatic factors; the size and character of the administrative units and attendance area; whatever legal barriers exist to be heeded or altered; the financial strength of the community; and the community's attitude.

When all possible information has been gathered, compiled, filtered, studied, digested, then, and only then, are the wits and pencils sharp enough to set down a single worthwhile line.

CHAPTER 12: Financing the Educational Plant



This building emphasizes the need of more extensive, varied space units to house the comprehensive program and complex equipment. High School, Seguin, Tex. Arthur Fehr and Charles Granger architects.

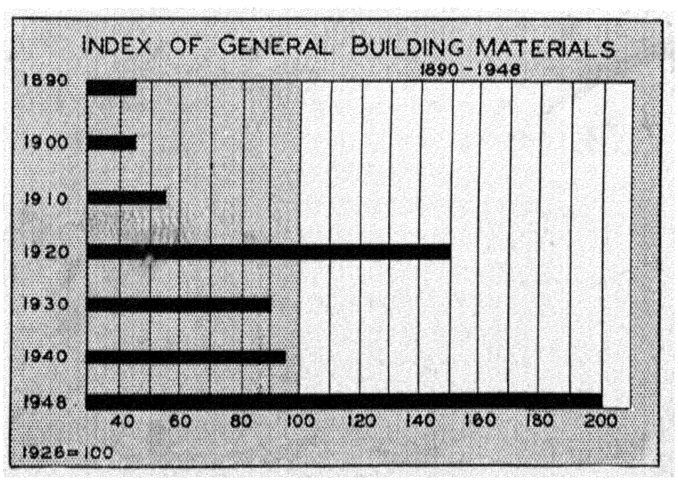
The pressing needs for more and better school plants stand revealed. The will to have them is not enough. Educational plants cost money. Lots of money. They always have and they always will. But the main question is not whether we can afford them; rather whether can we afford not to have them. The "we" is not just the people of a given school district. It is all of us—America-wide. Doakesville's problem child may become the mayor of your city, or the plant manager in mine. How he is educated makes a terribly real difference. And it is the author's premise that school plants affect closely the quality of the educational and community programs that go on within them. So the financing of educational plants is everyone's concern.

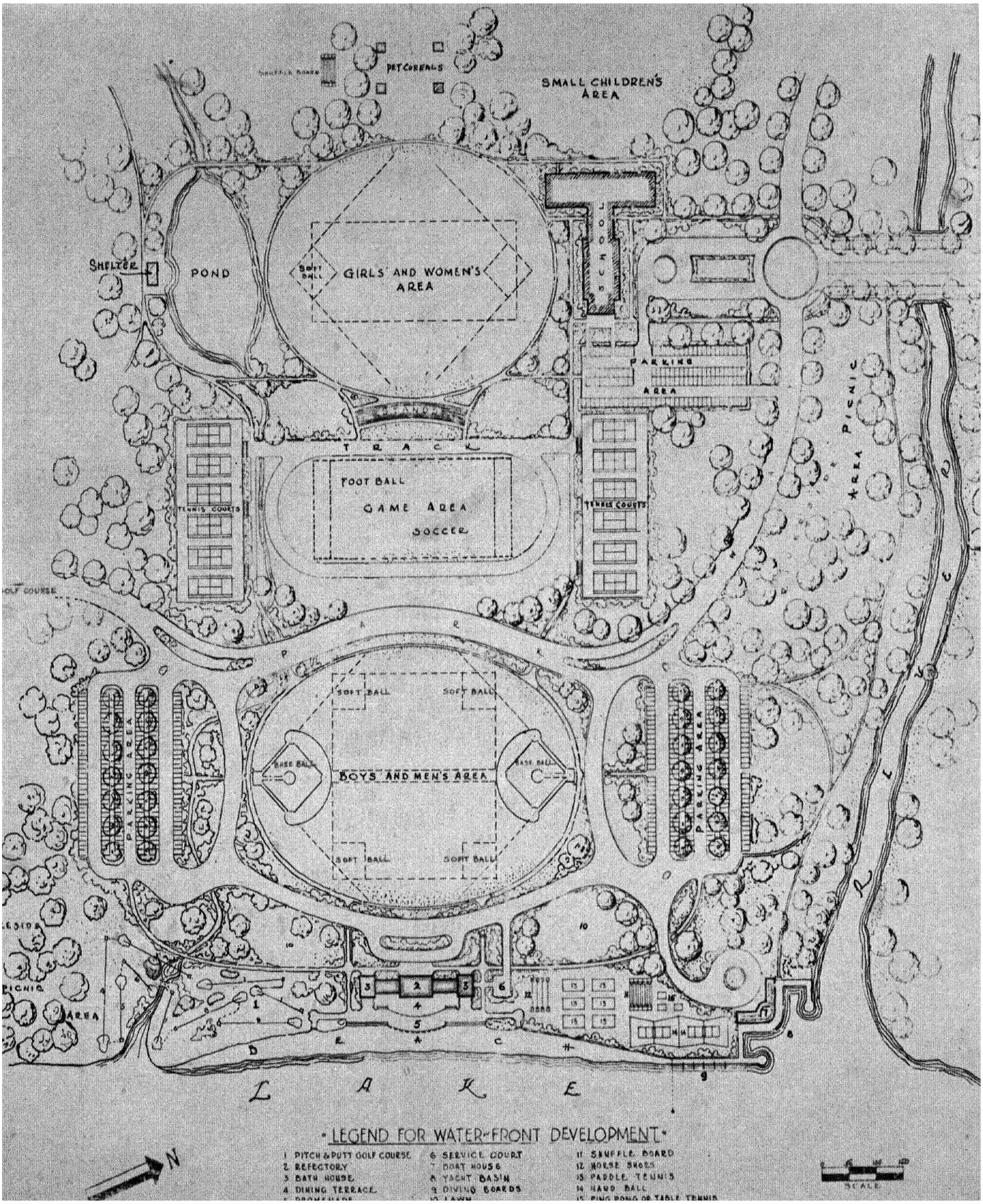
School plants have always cost money. Today they cost more than they did ten years ago. Ten years ago they cost more than they did fifty years ago. There are two main reasons for this. Larger and more complex school plants are needed to house today's program. They involve much more room and equipment than did the simple box-like structures of yesteryear on sites just large enough to hold their foundations.

Second, costs have gone up. They always have, throughout history, and there is no reason to expect the long-time trend to be reversed. In other words a dollar today does not buy as much goods and services as yesterday's dollar did. History suggests that tomorrow's will buy even less.

These two main reasons for higher cost make it essential for communities to plan carefully. They must determine their real needs. They must give first priority to first things. Then they must plan the financing. Paying for the plant is a major problem in any venture. It is a huge investment of the district's funds and often credit. It deserves community-wide, expert-aided planning. It is important.

Although there have been fluctuations, the index of general building materials has continued to rise, and there is no evidence to warrant a prediction that costs will drop materially in the future. *School Executive*, January 1949, page 89.





The above plan shows a suburban lake-bordered development and recreational project for a 75-acre site including year-round facilities for sports, physical education and recreation. The community field pictured at top comprises thirty acres. It features a seven-acre enclosed stadium with permanent bleachers and ample locker, dressing room, toilet and shower facilities. *School Executive*, January 1949, page 85.

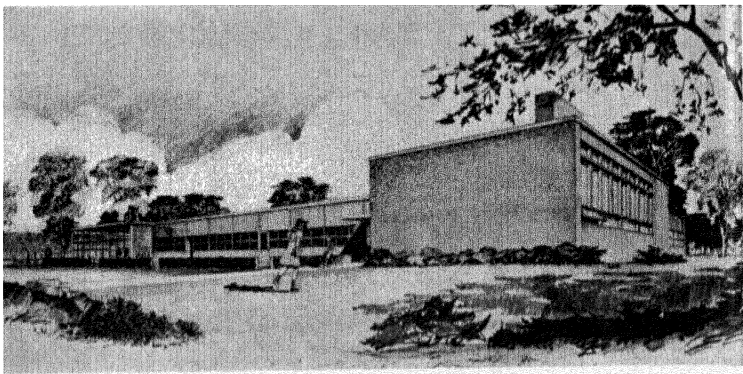
Let us look at this financing enterprise and the plant it will provide and compare it with one of 1900. What is involved that costs more money? First, there is land. Land itself costs more. In 1900 provision was made only for enough land on which to place the building with occasionally a little extra to set off the architectural monument—and a tiny bit of space for recess play. Now land may be required for more extensive buildings. It may be called on for recreational areas for both formal and informal games; maybe a nature area—garden and demonstration plots—plus landscaped areas—plus parking space—plus walks and drives. The acre of yesterday has become fifty acres today. And land by the acre costs more, often several hundred percent more.

The building of 1900 was usually a simple structure with space for classrooms and an office, and in more elaborate plants, an auditorium or meeting hall. Today these have to be provided—and they are larger and more numerous. Beyond these, however, special facilities are required. Libraries, lunchrooms, teaching aids, shops, homemaking departments, auditoriums, clamor for space. The specialized art programs, music, guidance, health, gymnasium and auxiliary services and programs, conference rooms, teachers' rooms, custodians' offices and shops, more and more storage as equipment and supplies multiply—all demand space. And the equipment is more extensive and intricate than in 1900—far more.

Too, technology has given us ventilating and heating systems, public address systems, master clock and program systems, acoustical controls, artificial lighting, expensive plumbing facilities—many of which were unknown in 1900—most of which were "nonessential" then.

So, the plant built to meet today's needs is quite a different one from most of those built in 1900. It costs more money. Hence it requires more financing.

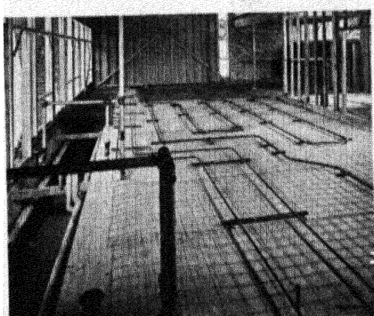
General building costs have increased. A dollar today cannot buy as much building as formerly and chances are it never will. In Dunn's Review for January, 1947, an excellent chart shows why. The chart applies to industrial buildings and probably represents an absolute minimum for school buildings whose complexity has grown so rapidly. A series of graphs indicate the erratic but ever upward movement of building costs since 1914. Using 1914's prices as 100, overall construction costs climbed steadily through the first World War to a peak of approximately 250 in 1920. In 1920 and 1921 costs

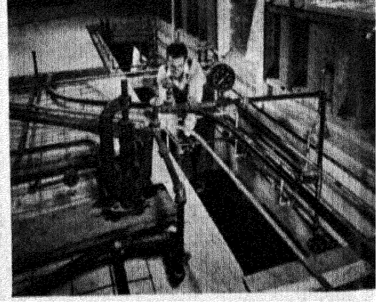


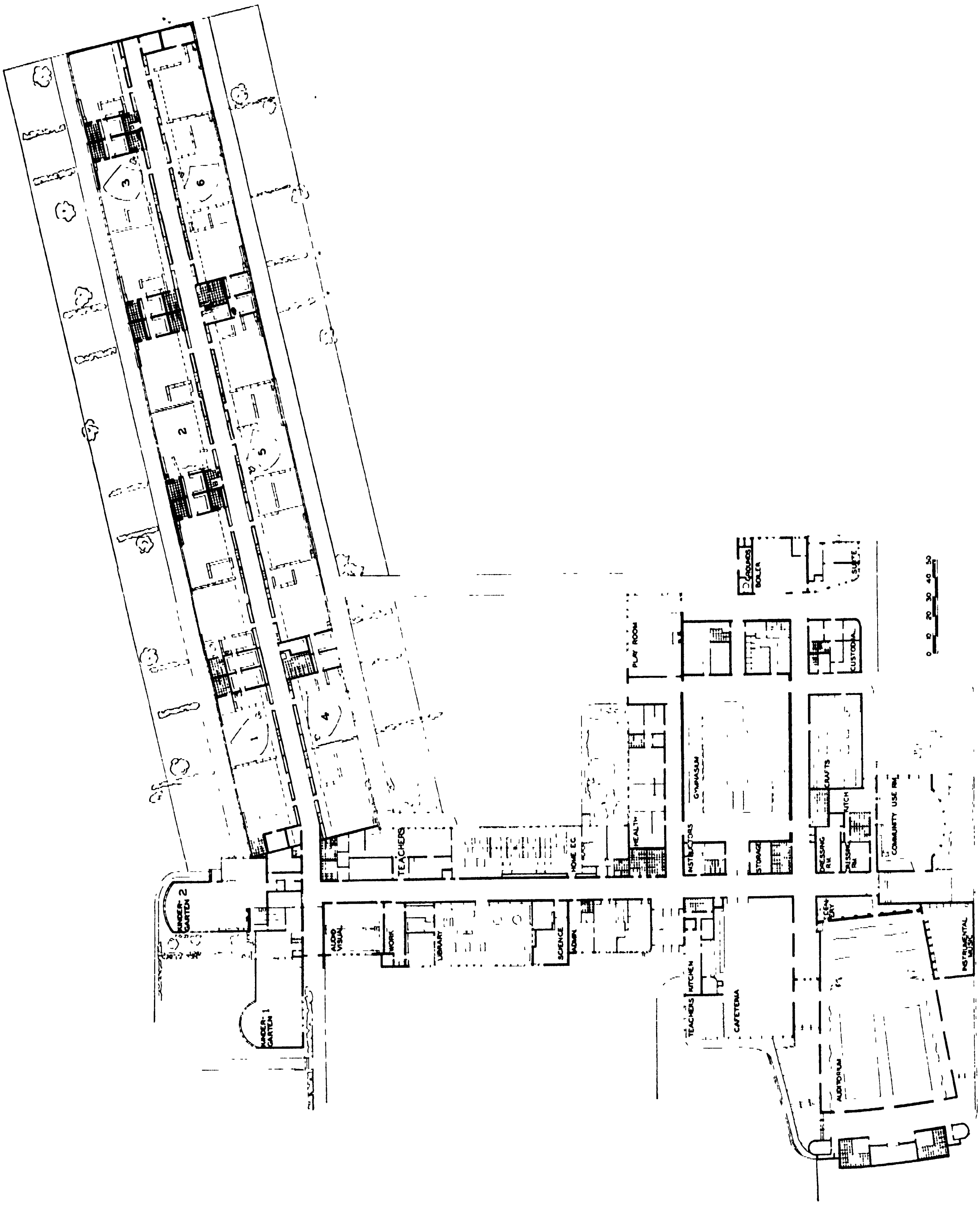
Of prime importance in a modern building is ample space for library, lunchroom, shops, homemaking department and auditorium. Elementary School, Bowmanville, Ontario. John B. Parkin Associates architects.

Without sufficient space for custodians and storage of equipment and materials, this school would lose its efficiency of operation and lessen the effectiveness of the program for the community. Clyde Lyon School, Glenview, Ill. Perkins & Will architects. Hedrich-Blessing photo.

Completed schools do not necessarily exhibit the higher costs as shown here in the case of plumbing which will soon be out of sight from the school visitor. Both labor and materials to provide necessary plumbing and heating facilities are claiming a larger share of the school building dollar. Perkins & Will architects. Hedrich-Blessing photo.







Suggested plan for elementary school. Courtesy
The American School and University.

School Plant Construction Cost Ranges§ as Reported, 1947–48

State	Cost Study Made by State Department		Cost per Square Foot			Cost per Cubic Foot			Cost per Classroom Unit		
	Yes	No	Low	Median	High	Low	Median	High	Low	Median	High
Ala.	x	...	$ 5 40	$ 7 50	$20 00	$ 66	$1 00	$2 00	$ 6,000	$8,000	$18,000
Ariz.	x	...	9 50	10 86	13 00	55	64	75	...	...	...
Ark.	x	...	8 00	10 00	12 00	...	...	...	6,256	7,820	9,370
Calif.	x	...	8.00	12 00	15 00	...	...	...	...	...	...
Colo.	...	x	...	...	...	...	...	...	...	...	...
Conn.	x	...	14 00	16 00	20 00	80	90	1 10	25,000	35,000	50,000
Del.	x	...	...	...	...	97	...	1 20	15,000	...	17,000
Fla.	x	...	6 50	8 50	12 00	41	53	75	5,850	7,650	10,800
Ga.	x	...	4 50	5 50	8 00	38	46	67	4,500	6,000	8,000
Idaho	x	...	...	...	...	50	75	1 00	...	...	...
Ill.	x	...	10 00	12 00	12 50	65	90	1 25	...	25,000	...
Ind.	...	x	...	...	...	...	...	...	...	...	...
Iowa	...	x	...	...	...	...	...	...	...	...	...
Kans.	x	...	...	...	...	70	1 00	1 30	10,000	15,000	20,000
Ky.	x	...	...	...	...	80	1 00	1 20	7,500	8,500	11,000
La.	...	x	...	...	...	...	...	...	...	...	...
Maine	x	...	...	...	...	...	73	...	13,000	...	27,000
Md.	...	x	...	...	...	...	...	...	...	...	...
Mass.	...	x	...	...	...	...	...	...	...	...	...
Mich.	...	x	...	...	...	...	...	...	...	...	...
Minn.	x	...	9 00	11 50	14 00	53	76	1 00	...	15,000	...
Miss.	x	...	3 75	5 42	8 71	...	...	...	...	...	...
Mo	x	...	6 00	10 00	12 50	50	75	1 05	5,000	12,500	20,000
Mont.	...	x	...	...	...	...	...	...	16,000	24,000	42,000
Nebr.	...	x	...	...	...	...	...	...	...	...	...
Nev.	...	x	...	...	...	...	...	...	...	...	...
N.H.	x	...	...	...	...	70	90	1 50	12,000	15,000	20,000
N.J.	x	...	...	...	...	72	...	1 25	20,000	...	30,000
N.Mex.	...	x	7.00	...	15 00	...	...	...	7,500	...	18,000
N.Y.	x	...	11 00	14 00	20 00	75	90	1 20	22,157	37,157	53,104
N.C.	x	...	6 00	10 00	16 00	30	50	75	6,000	...	...
N.Dak.	...	x	...	...	...	...	...	...	...	...	...
Ohio	...	x	...	...	...	...	...	...	...	...	...
Okla.	...	x	...	...	...	...	...	...	...	...	...
Oreg.	x	...	7 50	10 00	15 00	...	...	...	8,000	12,000	18,000
Pa.	...	...	...	...	...	...	...	...	15,000	20,000	40,000
R.I.	x	...	...	...	...	85	1 05	1 20	...	...	...
S.C.	x	...	8 00	10 00	12 00	...	...	...	5,280	6,600	7,320
S.Dak.	...	x	...	...	...	...	...	...	...	...	...
Tenn.	x	...	4 85	8 00	12 50	35	57	90	3,200	5,280	8,250
Texas	x	...	9 00	13 00	17 00	...	...	...	...	...	...
Utah	...	x	...	...	...	...	...	...	...	...	...
Vt.	...	x	...	...	...	...	...	...	...	...	...
Va.	x	...	9 00	11 50	16 00	50	60	95	11,000‖	14,000‖	19,500‖
Wash.	x¶	...	...	...	...	...	...	...	...	...	...
W.Va.	...	x	...	...	...	65	...	1 10	...	...	...
Wis.	...	x	...	...	...	75	88	1 25	15,000	20,000	25,000
Wyo.	...	x	...	...	...	...	...	...	...	...	...

§ Excluding equipment.
‖ Estimates of classroom costs do not include allowances for auxiliary spaces such as gymnasiums, auditoriums, play-rooms, cafeterias, etc.
¶ Study in progress.

Above table shows the status of school plant construction costs in 1947-48. *The Forty-Eight State School Systems,* Council of State Governments, Chicago, Ill. Table 40, page 213.

dropped sharply to about 180. Then they leveled off at about 200 until the depression years, when they dropped back to about 160. In 1934 they began to rise again—and they haven't stopped yet. In 1948 the 100 of 1914 had left 300 far behind. Industrial plants cost more than three times as much as in 1914; educational plants at least that.

In 1939, the cost per cubic foot of school buildings was roughly between forty and fifty cents. In 1948 the *same type* of building averaged in the neighborhood of one dollar per cubic foot. Some economists call this the inflationary cycle—which is not a circle but an upward spiral. Undoubtedly the future will show an occasional sharp recess from record highs for short times, but unless trends of the long past are completely unreliable, it can be expected that over the years to come costs will continue to increase. More dollars, then, will have to be spent to buy a given amount and quality of space.

But educational plants, unlike some other construction, cannot be delayed. A needed highway which is not built may cause inconvenience. A new store or factory delayed a few years may cause loss of profit to the owners and inconvenience to the customers for a time. But when a school plant needed to provide educational opportunity for children is not built, the right to education for those children is gone forever. An oh so pointed truism is: Each child is young only once.

The money to build public school plants comes chiefly from one source—taxation. By tradition local school districts have put up most of that money. As we shall see later there is, however, a trend for the state to share, and the Federal Government to help, in the financing of new school construction. But in the local taxing unit there are two possible methods of raising the money needed. Taxes may be paid in advance so that the money is available when the new plant is needed, or money may be borrowed through the sale of bonds against the pledge of taxes to be laid in years ahead. The first plan is commonly called the "pay-as-you-go" system. The second is referred to as deferred financing—or "pay (with interest) as-you-use-it."

Although most of us like to pay cash when we can, it is not always possible in building schools. The need cannot wait, often. And many districts do not have the financial ability to raise the amount of money required in time to meet those needs. There are some, too, who hold that those who are to profit from the new plant throughout its lifetime should help pay for it. Thus the issuance and sale of bonds has become the accustomed method for most school districts to pay for new school construction. This method costs more in taxes than the pay-as-you-go. A district putting away fifty thousand dollars a year would have $1 million in much less than twenty years. Interest works for them. But paying back a loan of $1 million would take a full twenty years just for the loan itself. And interest is on top of that. Some bond issues have cost more in interest than the loan itself. Good bonds in today's market do not. But 2½ percent on $1 million is twenty-five thousand dollars, in one year.

Students of finance usually recommend that bonds to finance new schools be issued for a period not longer than twenty-five years. This is well within the life expectancy of the building. Further they recommend that the financing program be arranged so that some of the bonds will be paid off each year, and that it will take about the same tax effort each year of the twenty-five to pay both interest and principal retirement. Any community planning to issue bonds for new school construction would be well advised to get the best available technical help in setting up its financial plan and procedures. Once set up, such a program should be followed faithfully.

The period since World War II has been a particularly favorable one for the issuance of bonds. There has been a good demand because of the gilt-edged security of the vast majority of such bonds. The net interest rate has been unusually low. Indications are that such rates will continue relatively low for many years to come. The very large indebtedness of the Federal Government and its planned method of debt retirement require that interest rates be kept low. Lawler* says that "it is probable that shifts in the interest rate in the next few years, barring drastic changes in the economic outlook, will not be great enough to exercise a decisive influence on building construction."

But pay-as-you-go or bond issue, or a combination, all require popular support and vote in most districts. Some districts get this support by a great publicity barrage alone. Pamphlets, radio, press, posters, speakers—all are enlisted. Children carry home brochures. Trucks with public address equipment roam the streets. This is one way. It often works. It shows a concern for public relations. If the purposes of the bond issue are sound and the financing program worked out clear-sightedly, this campaign may have nothing but good results and after-effects.

* Eugene S. Lawler, "To Build Or Not To Build." *American School and University*, 1948-49. Page 49.

The school plant services provided by the different states vary greatly. *The Forty-Eight State School Systems,* Council of State Governments, Chicago, Ill. Table 44, page 219.

School Plant Services§ Provided by the States, 1947–48

State	No. of Staff Members	Surveys or Studies	School Centers	School Sites	Plans for Financing	Preparation of Plans		Approval of Plans	Approval of Building
						Small Bldgs.	Any Bldg.		
Ala.	4	St. Dept.	Appr.	Appr.	Appr.	Yes	Yes	Appr.	Dept. of Ed.
Ariz.	0	None	Consult.	Consult.	Consult.	No	No	Consult.	None
Ark.	2	St. Dept.	Appr.	Appr.	Appr.	Yes	No	Appr.	None
Calif.	No Info.	St. Dept.	Appr.	Appr.	No Info.	Yes	No	Appr.	Div. of Arch.
Colo.	0	None	None	None	None	No	No	None	None
Conn.	1	None	Consult.	Consult.	Tax Com.	No	No	Appr.	Bldg. Com.
Del.	0	St. Dept.	Appr.	Appr.	Budget Com.	Yes	Yes	Appr.	Bldg. Com.
Fla.	2	St. Dept.	Appr.	Appr.	Appr.	Yes	No	Appr.	Dept. of Ed.
Ga.	3	St. Dept.	Appr.	Appr.	None	Yes	No	Appr.	Dept. of Ed.
Idaho	0	Co. Com.	None	None	Appr.	Yes	Yes	Appr.	Bd. of Ed.
Ill.	¼	Reorg. Com.	None	None	Consult.	No	No	None	None
Ind.	1	None	Consult.	Consult.	Tax Com.	No	No	Adm. Bldg. Coun.	Adm. Bldg. Coun.
Iowa	0	Co. Bd.	None	None	Consult.	Yes	No	Consult.	None
Kans.	0	None	None	None	None	No	No	State Arch.‖	None
Ky.	2	St. Dept.	Appr.	Appr.	Appr.	Yes	No	Appr.	None
La.	1	St. Dept.	Consult.	Consult.	Bond Board	Yes	Yes	Appr.	¶**††
Maine	1	None	Consult.	Consult.	Consult.	Yes	No	**††	**††
Md.	1	St. Dept.	Consult.	Appr.	Consult.	No Info.		Appr.	None
Mass.	0	Bld. Com.	None	None	None	No	No	None	None
Mich.	1	St. Dept.	Consult.	Consult.	Consult.	No	No	Appr.	¶
Minn.	2	None	Appr.	Appr.	None	Yes	No	Appr.	Dept. of Ed.
Miss.	1	St. Dept.	Consult.	Consult.	Consult.	Yes	No	Appr.	Dept. of Ed.
Mo.	1	St. Dept.	None	Appr.	Appr.	No Info.		Appr.	Bd. of Ed.
Mont.	0	None	None	Appr.	Land Board	Yes	No	Appr.	None
Nebr.	0	None	Consult.	Consult.	Consult.	No	No	Consult.	None
Nev.	0	None	None	None	None	Yes	No	Appr.	None
N.H.	½	St. Dept.	Consult.	None	None	Yes	No	None	None
N.J.	1	St. Dept.	Consult.	Consult.	Appr.	No	No	Appr.	Dept. of Ed.
N.Mex.	0	None	Appr.	Appr.	Appr.	Yes	No	Appr.	None
N.Y.	6	St. Dept.	Consult.	Consult.	Consult.	No	No	Appr.	None
N.C.	2	St. Dept.	Appr.	Appr.	None	No	No	Appr.	Bd. of Ed.
N.Dak.	0	Reorg. Com.	Consult.	Consult.	Consult.	No	No	Appr.	Consult.
Ohio	1	None	None	None	None	No	No	‡‡	None
Okla.	0	None	Consult.	Consult.	Consult.	Yes	No	Consult.	None
Oreg.	1	None	Consult.	Appr.	Consult.	No	No	Appr.	Consult.
Pa.	5	None	Appr.	Appr.	Appr.	Yes	No	Appr.	None
R.I.	0	St. Dept.	Consult.	Consult.	Consult.	No	No	Consult.	None
S.C.	2	None	Consult.	Consult.	Consult.	Yes	No	Appr.	Dept. of Ed.
S.Dak.	0	None	Consult.	Consult.	Consult.	No	No	Appr.	Consult.
Tenn.	3	St. Dept.	Consult.	Appr.	Consult.	Yes	No	Consult.	Consult.
Texas	1	St. Dept.	Appr.	Appr.	Atty. Gen.	Yes	Yes	Appr.	Dept. of Ed.
Utah	½	St. Dept.	Consult.	Consult.	Consult.	No	No	Appr.	None
Vt.	¼	None	Consult.	††	Consult.	Yes	Yes	¶††	¶††
Va.	4	St. Dept.	Appr.	Appr.	Consult.	Yes	No	Appr.	Consult.
Wash.	3	St. Dept.	Appr.	Appr.	Appr.	No	No	Appr.	Bd. of Ed.
W.Va.	1	None	Consult.	Consult.	Tax Com.	No	No	Appr.	Appr.
Wis.	2	Co. Com.	Consult.	Consult.	Consult.	No	No	Consult.	None
Wyo.	0	Reorg. Com.	Consult.	None	Consult.	No	No	None	None

§ Consultative services only (consult.) or approval and consultative services (appr.) by state department of education unless otherwise indicated.

‖ Limited approval related to fire safety.

¶ State fire marshal.

** Department of education.

†† Board of health.

‡‡ Dept. of industrial relations.

Although local bond issues are still the principal method of financing school building programs, an increasing number of states are giving authorizations for pay-as-you-go plans. *The Forty-Eight State School Systems,* Council of State Governments, Chicago, Ill. Table 41, page 214.

METHODS OF FINANCING SCHOOL PLANT CONSTRUCTION IN THE STATES, 1947–48

State	State Loans§		State Aid Funds Provided	Local Bond Issues Authorized	Special Local Tax Levies (Partial Pay-as-You-Go)		Funds for Construction May Be Included in Current Budget	Holding Companies Authorized
	Available	Interest Rate			Authorized	Maximum Rate (Mills per Dollar)		
Ala.			Yes	Yes			Yes	
Ariz.			No	Yes				
Ark.	Yes	4	No	Yes			Yes	
Calif.			Yes	Yes	Yes		Yes	
Colo.			No	Yes				
Conn.			Yes‖	Yes	Yes		Yes	
Del.			Yes	Yes				
Fla.	Yes	2½ to 4	Yes	Yes	Yes	4	Yes	
Ga.			No	Yes				
Idaho			No	Yes				
Ill.			No	Yes				
Ind.			No	Yes	Yes	7½ for 12 yrs.	Yes	Yes¶
Iowa			No	Yes				
Kans.			No	Yes	Yes	2	Yes	
Ky.			No	Yes	Yes	1½		Yes
La.	**		Yes††	Yes	Yes	5 for 10 yrs.		
Maine			No‡‡	Yes	Yes	No Limit		
Md.			Yes	Yes			Yes	
Mass.			Yes	Yes				
Mich.			Yes§§	Yes	Yes	½		
Minn.	Yes	2½	No	Yes	Yes	8		
Miss.			Yes	Yes				
Mo.			Yes‖	Yes	Yes			
Mont.			No	Yes				
Nebr.			No	Yes	Yes	5		
Nev.			No	Yes				
N.H.			No	Yes			Yes	
N.J.			No	Yes	Yes			
N.Mex.			No	Yes			Yes	
N.Y.			Yes‖‖	Yes	Yes		Yes	
N.C.	Yes	4	No	Yes				
N.Dak.			No	Yes	Yes	2		
Ohio			Yes	Yes			Yes	
Okla.			No	Yes	Yes		Yes	
Oreg.			No	Yes	Yes	50	Yes	
Pa.			Yes‖	Yes	Yes		Yes	Yes¶
R.I.			Yes‖	Yes			Yes	
S.C.			No	Yes	Yes	No Limit		
S.Dak.			No	Yes			Yes	
Tenn.			Yes	Yes	Yes		Yes	
Texas			No	Yes			Yes	
Utah			No	Yes	Yes	¶¶	Yes	
Vt.			Yes‖	Yes	Yes		Yes	
Va.	Yes	2	Yes††	Yes	Yes	10½	Yes	
Wash.			Yes	Yes	Yes	As voted	Yes	
W.Va.			No	Yes			Yes	
Wis.	Yes	2½	No	Yes	Yes			
Wyo.			No	Yes				

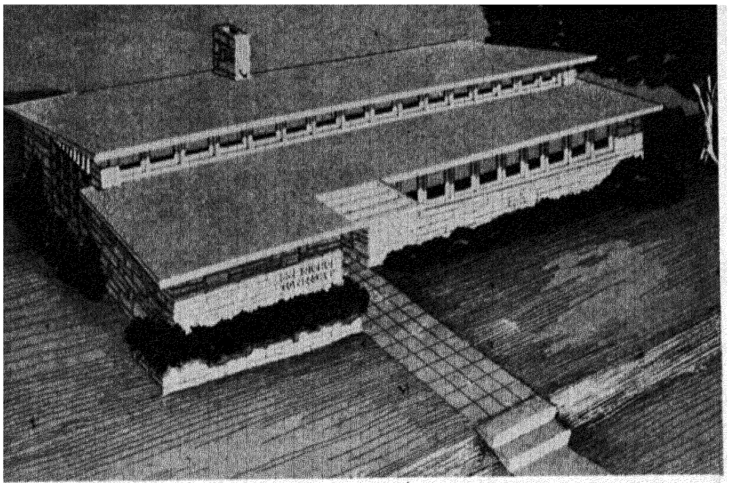
§ State loans or state funds used for investing in school bonds.
‖ Very small amount chiefly for equipment and small buildings.
¶ Not actually in operation.
** Parishes may withdraw and use for buildings their permanent fund held by state.
†† For vocational buildings.
‡‡ Some funds for surveys and plans.
§§ A limited part of certain funds may be used.
‖‖ For central rural schools only.
¶¶ Ten per cent of minimum program plus 10 per cent by vote of people.

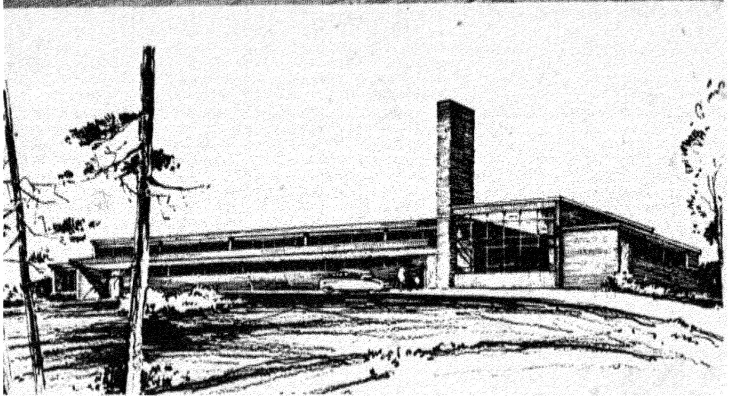
Provisions Relating to School Bond Issues in the States, 1948

State	Purpose: Only Capital Outlay	Purpose: Capital Outlay and Other	Maximum Percentage of Assessed Valuation: For School Bonds	Maximum Percentage of Assessed Valuation: Applies to All Bonds	Voting Requirements: Election Required	Voting Requirements: Voting Qualifications Required	Voting Requirements: Proportions‖	Further Approval by State Agencies
Ala.	Yes	. .	[a]	No	No	. .	. .	St. Supt.
Ariz.	Yes	. .	10	No	Yes	Prop. owners	Maj.	None
Ark.	Yes	. .	7–11[b]	No	Yes	Regular	Maj.	None
Calif.	Yes	. .	5	No	Yes	Regular	Maj.	None
Colo.	Yes	. .	7–10[c]	No	Yes	Taxpayers	Maj.[d]	None
Conn.	Yes	. .	5[c]	Yes	Yes	Regular	Maj.	Tax Dept.[e]
Del.	Yes	. .	5[f]	Yes	Yes	Regular	Maj.	Bd. of Ed.[f]
Fla.	Yes	. .	10–20	No	Yes	Prop. owners	Maj.[d]	Dept. of Ed.
Ga.	Yes	. .	7	No	Yes	Regular	Maj.	None
Idaho	Yes	. .	6–10[c]	Yes	Yes	Regular	Maj.	Bd. of Ed.
Ill.	. .	Yes	5	No	Yes	Regular	Maj.	None
Ind.	. .	Yes	2[g]	No	Yes	Regular	Maj.	Tax Com.
Iowa	Yes	. .	5	Limit[h]	Yes	Regular	60%	None
Kans.	Yes	. .	10	Yes	Yes	Regular	Maj.	None
Ky.	Yes	. .	2[i]	No	Yes	Regular	2/3	Dept. of Ed.
La.	. .	Yes	15	No	Yes	Prop. owners	Maj.	Bond and Tax Bd.
Maine	Yes	. .	5	Yes	Yes	Regular	Maj.	None
Md.	. .	Yes	[j]	. .	No[j]	Legislature[j]	. .	[j]
Mass.	Yes	. .	6	Yes	Yes	Regular	Maj.	None
Mich.	Yes	. .	15	Varies	Yes	Prop. owners	Maj.[k]	Mun. Fin. Com.
Minn.	. .	Yes	15[l]	Yes	Yes	Regular	Maj.	None
Miss.	Yes	. .	15	Yes	Yes	Regular	Maj.	None
Mo.	Yes	. .	5	No	Yes	Regular	2/3	None
Mont.	Yes	. .	3	No	Yes	Prop. owners	Maj.[m]	Land Bd.
Nebr.	. .	Yes	40	Yes	Yes	Regular	66 2/3%	Auditor
Nev.	Yes	. .	Up to 10[c]	No	Yes	Regular[n]	Maj.	None
N.H.	Yes	. .	5[o]	No	Yes	Regular	2/3[d]	[o]
N.J.	Yes	. .	6–9[c]	No	Yes[p]	Regular	Maj.	Atty. Gen.
N.Mex.	Yes	. .	6	Yes	Yes	Regular	Maj.	None except budget approval
N.Y.	Yes	. .	2–10[c]	Yes	Yes[q]	Regular[q]	66%	Dept. of Ed.
N.C.	Yes	. .	5	No	Yes	Regular	Maj.	Loc. Govt. Com.
N.Dak.	Yes	. .	10	No	Yes	Regular	67%	None
Ohio	Yes	. .	6	Yes	Yes[r]	Regular	65%	Dept. of Tax.[r]
Okla.	. .	Yes	5	No	Yes	Regular	Maj.	Atty. Gen.
Oreg.	Yes	. .	10[s]	No	Yes	Regular	Maj.	None
Pa.	Yes	. .	2–7[c]	No	Yes[t]	Regular	Maj.	Dept. Int. Aff.
R.I.	Yes	. .	3	Yes	Yes	Regular	Maj.	None
S.C.	Yes	. .	8[u]	No	Yes[u]	Regular	Maj.	None
S.Dak.	. .	Yes	5	Yes	Yes	Regular	60%	None
Tenn.	. .	Yes	10	No	No	Legislature[v]	. .	None[v]
Texas	Yes	. .	7	No	Yes	Prop. owners	Maj.	Bd. of Ed.
Utah	. .	Yes	3–4[c]	No	Yes	Prop. owners	Maj.	None
Vt.	. .	Yes	10	No	Yes	Regular	Maj.	None
Va.	Yes	. .	18[w]	Yes	Yes	Regular	Maj.	None
Wash.	Yes	. .	5	No	Yes	Regular	60%[x]	Auditor
W.Va.	. .	Yes	5	No	Yes	Regular	60%	Tax. Com. and Atty. Gen.
Wis.	. .	Yes	5	No	Yes	Regular	Maj.	None
Wyo.	Yes	. .	6	Yes	Yes	Taxpayers	Maj.	None

Because of increasing school building costs, many states are raising the maximum percentage of assessed valuations that may be borrowed to finance the school building program. *The Forty-Eight State School Systems*, Council of State Governments, Chicago, Ill. Table 42, page 215.

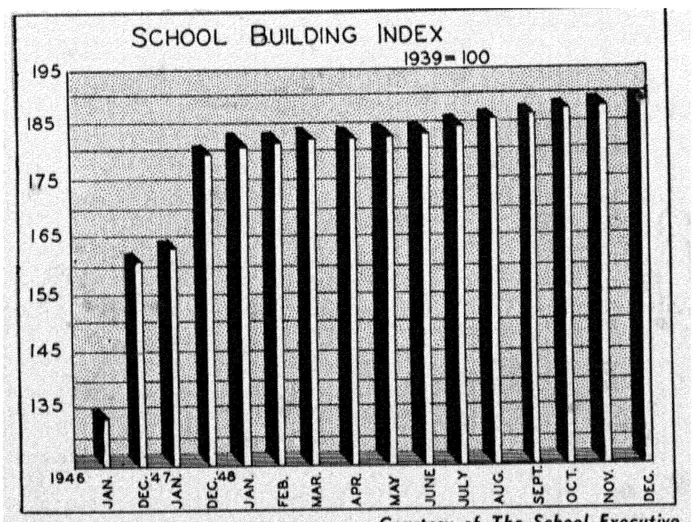
Citizens in a community want a [illegible] school when they are shown that such a building program is financially sound and will meet the need of the community. Popular support can come only after understanding of the proposed plans. Nichol Township School. John B. Parkin Associates architects.





Joint cooperation between local, state and federal agencies to finance adequately the community school will not bind the community to an inadequate school plant or too large a debt which would limit the operation of the program.

Formerly and even now in some cases, the entire cost of the school plant was borne by the local school districts. However, the trend for states to assume a share of the cost is rapidly growing. By January 1, 1949 nineteen states had legislation providing financial assistance. During the depression, World War II and the immediate postwar years, federal assistance was made under different guises.



Courtesy of *The School Executive*

Those communities where the study, the planning, the figuring have been widely shared; where every agency and force, practically every individual with something to contribute has worked together, thought together, planned together; already have strong support for their financing. It is important, of course, that everyone be reached in the last few days before a vote — but in this community many have only to be rearmed, reminded of the plans in which they participated. They talk it over with their neighbors; they put on the campaign. No longer is it the school district selling its voters on a plan. Here it is the people of the community, leaders, helping each other over the last hurdle—the actual vote. If there were no other argument for community planning in so important a community enterprise as the new school plant, this alone would justify it.

Unfortunately, as was indicated in the chapter on needs, there are communities whose needs far exceed their ability to pay. A taxing agency with a broader base is needed, hence the trend in state participation in financing new construction. The courts have held repeatedly that education is a function of the states. Today's education means costly plant facilities. An increasing number of states have acted. Others are considering action. The pattern seems to be for states to contribute part of the costs of new schools from taxes collected on a statewide basis, school districts to provide a part (usually a very great part) of the major share from its local taxes. Ray L. Hamon, Chief of the School Housing Section in the Federal Office of Education writing in *The School Executive* magazine of November, 1948, said:

> *"Since 1925 there has been a pronounced trend toward greater state participation in the financing of foundation or minimum educational programs. Only in recent years, however, have states recognized their responsibilities for sharing the cost of providing satisfactory physical facilities for education. There is a definite trend toward state aid for capital outlay. Nineteen states, in 1948, provided some financial assistance to local school districts for capital outlay. Ten of these state aid programs are quite significant, but the other nine are rather meager. Several states not now providing this assistance are contemplating legislation for this purpose, and some states with limited aid are contemplating substantial increases."*

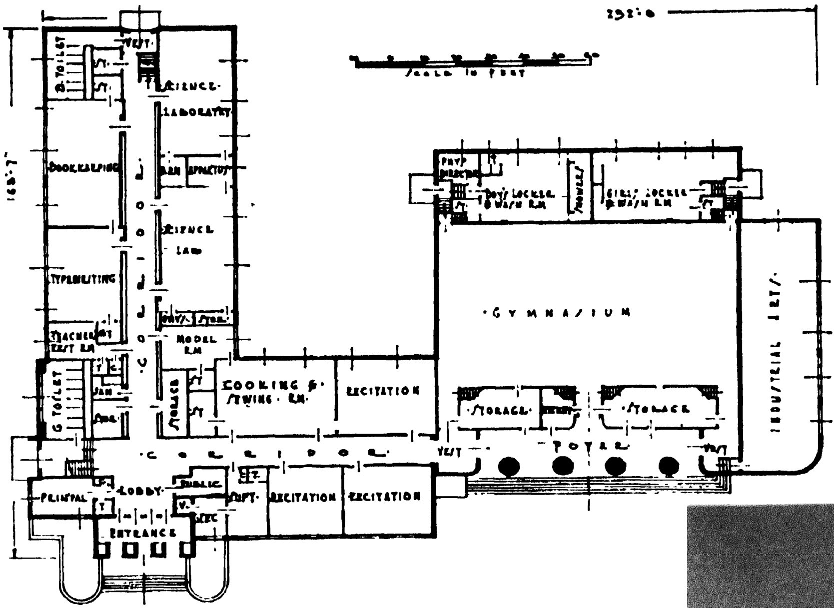
The reader is referred to this article for a summary of state capital outlay aid in 1948.

State aid is growing. Can it fill the need, particularly in the less financially able states?

State	Type of Fund			Amount Provided by State	Basis for Apportionment	Local Effort and Funds Required		Funds Provided for		Funds Used for	
	Found. Program	Special	General			Effort	Funds	All Sch. Systems	Apvd. Appl.	Any Bldg.	Perm. Centers
Ala.	x	.....	......	$1,530,087[a]	$52 44 per classroom unit	For found. program	$5,000,000 (Approx.)	x	.... ..	. . .	x
Ariz.	none										
Ark.	none (except for loans)										
Calif.	......	x	......	55,000,000[b]	Budget deficiency	Whatever needed	Indefinite	....	x	.. ..	x
Colo.	none										
Conn.	......	x	.....	1,538,158	½ of cost up to maximum	Whatever needed	½ of cost	....	x	. ..	x
Del.	.....	x	......	1,396,827	Need and effort	As prescribed	1,455,478	. . ..	x	. . .	x
Fla.	x	.....	......	3,869,000	$300 per classroom unit	For found. program[c]	2,860,000	x	. .	. . .	x
Ga.	none										
Idaho	none (except small amounts may be used from equalizing fund)										
Ill.	none										
Ind.	none (except for minor equipment)										
Iowa	none										
Kans.	none (except small amounts from general fund may be used for that purpose)										
Ky.	none										
La.	.....	x	......	75,000	Chiefly school census	none	....	Voc. only	.....	. . .	Voc. bldgs.
Maine	......	. . .	x	About 10,000	¼ cost of plans and surveys paid to towns by state						
Md.	.....	x	......	1,463,005	$10 per pupil minus 5¢ levy yield	5¢ levy	Indefinite	x	.....	x	.. ....
Mass.	.....	x	......	Indefinite	20 to 50 per cent of cost[d]	Whatever needed	Balance Needed	....	x[e]	.	x
Mich.	.....	......	x[f]	Indefinite	Part per capita; part need	For school aid fund	Indefinite	x	......	x	.. ..
Minn.	none (except for loans)										
Miss.	......	x	......	3,000,000[b]	50 per cent of approved cost up to $2000	Whatever needed	Indefinite	. ...	x	. . .	x
Mo.	......	x 2 funds	......	51,000	½ appr. cost up to $2000; $1000 for abandoned building	Whatever needed	Indefinite	....	x	. . .	x
Mont.	none										
Nebr.	none										
Nev.	none										
N.H.	none (except small amounts for equipment and repairs)										
N.J.	none										
N.Mex.	none (except district may use part of surplus, including state funds, under certain conditions)										
N.Y.	x	......	......	Varies[g]	$450 per pupil, less local effort[h]	6 per cent of property value	Indefinite	.. .	x	.. .	x (Central Dist.)
N.C.	none (except for loans)										
N.Dak.	none										
Ohio	......	x	......	1,000,000	Need above local effort	6 mills operating or 8½ total	Indefinite	....	x	.. .	x
Okla.	none (except for special conditions[i])										
Oreg.	none										
Pa.	......	x	......	75,000	Serious Need	Maximum	Indefinite	....	x	...	x
R.I.	......	x	......	12,077	Emergency	Maximum	Indefinite	... .	x[e]	x	....
S.C.	none										
S.Dak.	none										
Tenn.	.. ...	x	......	14,456,000[j]	Area and population	None	None	County only	.....	x	....
Texas	none										
Utah	none										
Vt.		x 2 funds		15,000	Matching	Whatever needed	Indefinite	....	x	x	....
Va.	none (except for loans and small amounts for vocational buildings and equipment)										
Wash.	......	x	......	5,425,820	25 to 75 per cent of cost (formula for equalization)	Whatever needed	Indefinite	....	x	.. ..	x
W.Va.	none										
Wis.	none (except for loans)										
Wyo.	none										

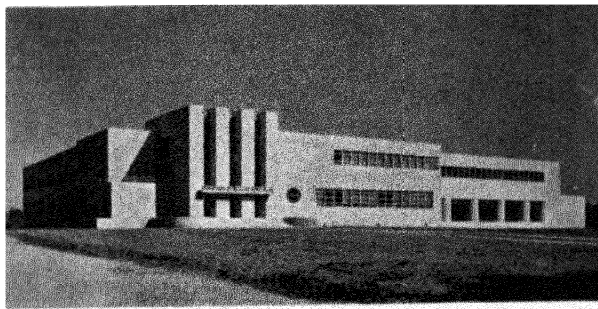
[a] Plus $11,871,000 special appropriation for biennium.
[b] Emergency for biennium
[c] Plus $100 per instruction unit.
[d] One-quarter cost × ratio of equated assessed value per pupil in town and in entire state.
[e] May include cost of surveys and plans
[f] Any part of sales tax diversion fund and up to 17 per cent of school aid fund.
[g] Average has been about $700,000 per year during recent years.
[h] Adjusted according to building cost index.
[i] Special legislative act applying to a designated district may provide, one time, up to $1,250 for a union graded district, or $2,500 for a consolidated district.
[j] 70 per cent of sales tax above $20,000,000.

Nineteen states have now established some form of aid for school plant construction. *The Forty-Eight State School Systems*, Council of State Governments, Table 43, pages 217-218.

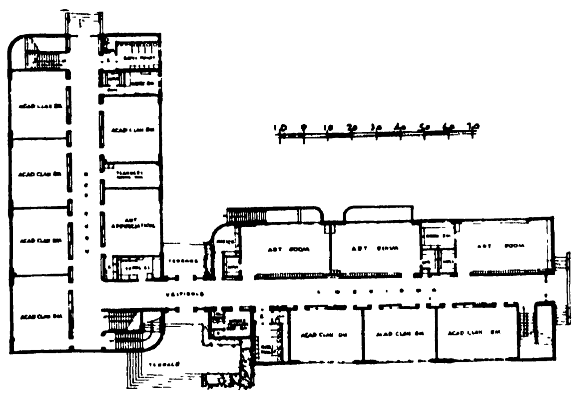


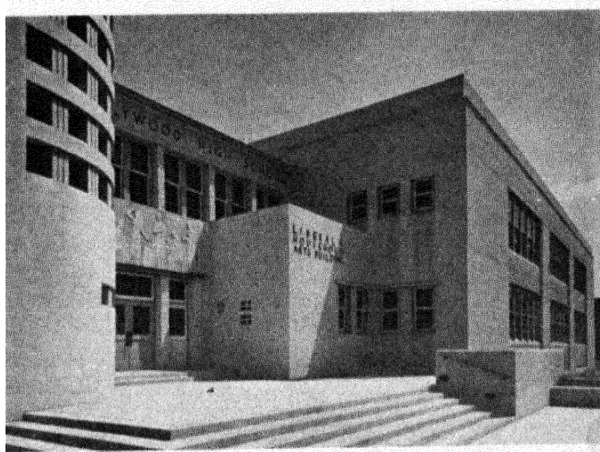
These three schools are examples of work done by the Public Works Administration and are reproduced through the courtesy of the PWA from their book, *Public Buildings: A survey of architecture of projects constructed by federal and other governmental bodies between the years 1933 and 1939 with the assistance of the Public Works Administration* by C. W. Short and R. Stanley Brown, pages 165, 312, and 235.

Left and below: Columbia High School, Columbia, Miss. Construction of this building is monolithic concrete, fireproof throughout. The ceilings are covered with soundproofing material. The second floor of this building contains the library, eight classrooms and a study hall.

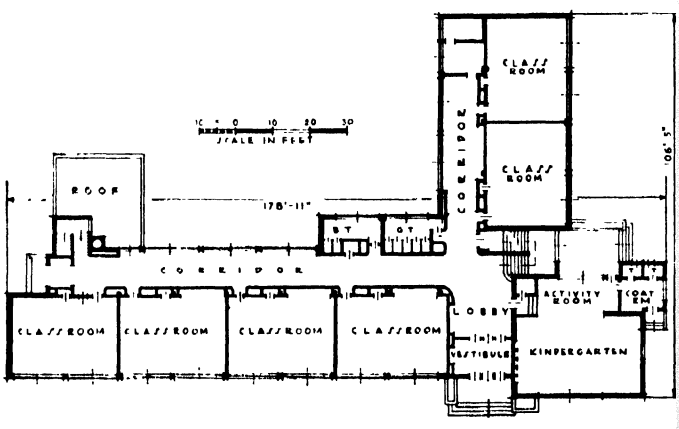


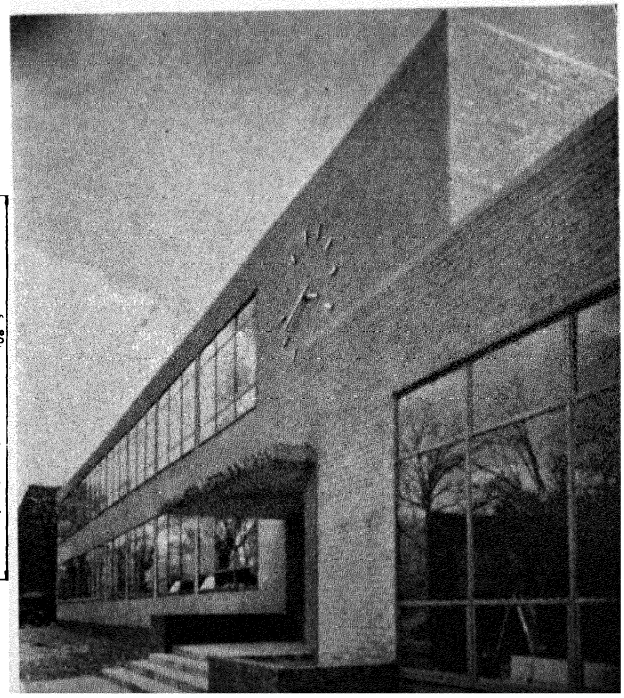
Below: The liberal and household arts building of Hollywood High School, Los Angeles, Cal. is one of two units constructed with PWA aid.





Below: A PWA project built in 1935 at Northville, Mich. It is of fireproof construction with reenforced concrete foundation, walls and floors.





The answer to this question is as important to those in the wealthier states as to those most immediately affected. There is a steadily increasing demand that the Federal Government lend its financial assistance to the construction of school plants. Recognition that both wealth and people are mobile and are not necessarily in constant company is one of the bases on which federal assistance is sought. Only the Federal Government can seek out wealth where it is, regardless of state or regional boundaries, and tax it. Another basis for federal sharing with states is provided by those who point to the growing encroachment on taxable wealth of federal taxes, the narrowing field of wealth still exclusively, or even principally, taxable by states. The answers are not easy. But one truth is paramount. The educational ability of people of every section is of vital concern to those of every other section. The answers must be found.

During the depression years of the 1930's, through the Public Works Agency and the Works Progress Administration, grants-in-aid were provided to many communities for the construction of needed school buildings. During World War II under provisions of the Lanham Act over 9,000 classrooms were built with federal funds. Most of these were as temporary as the housing developments they served. Some were not. Many are still in use. After World War II the Federal Works Agency was authorized to provide funds for aid in planning new school buildings. Under the provisions of the Act these funds were to be repaid when the buildings were constructed. The appropriations made thus far have not been sufficient to meet the demand for them.

In recent years, many bills have been introduced in Congress providing authorization of sizeable appropriations to aid the states with money for education. Some have been specifically aimed at helping in new construction. Most have been based on the school population and the financial ability of the states. Support for such bills cuts across party lines. Senator Taft has said:

> *"There are a number of states which simply cannot provide enough funds for adequate education, even though they spend a larger amount of their citizens' incomes than do more prosperous states. I feel that the whole country has an interest in seeing that at least a minimum education is provided for every child born in the United States."*

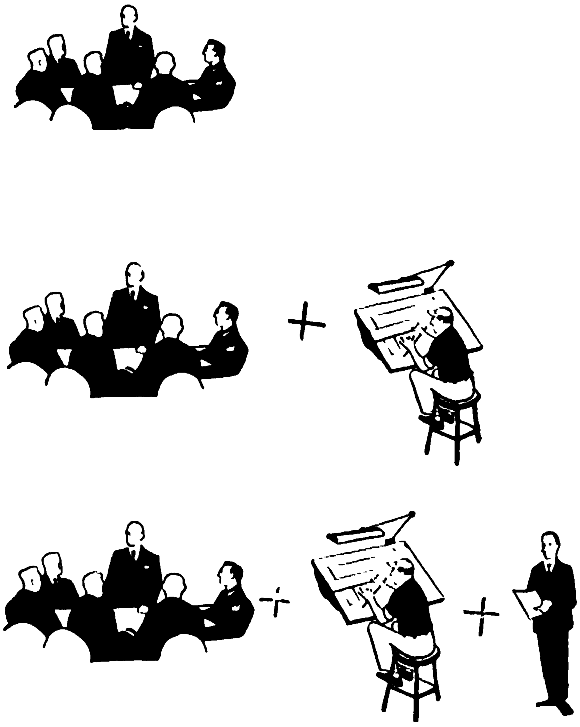
And President Truman has commented:

> *"I regard the proper education of our youth as a matter of paramount importance to the welfare and security of the United States. Public provision for education has been primarily the concern of the several states, and must remain so. . . . The cost of providing adequate systems of schools has long been beyond the financial resources of many of our states. Now a real crisis exists. . . . Unless the Federal Government comes to the aid of the states in meeting these needs, there is danger of a serious breakdown in our system of education. We cannot take such a risk."*

While no action had been taken as 1949 began, the trend was interesting. The prediction seems justified that future years will see a considerable part of the cost of new school buildings borne by the Federal Government. The parallel may be drawn from the experience in federal assistance for the construction of highways.

Facilities to house a good educational program are expensive. They must be paid for. Whether this paying is entirely local, borne principally by real estate taxes; or state, borne by statewide tax bases; or federal, borne by nationwide tax bases; or whether it is a combination of two or three of these; in any case people must pay for them. People must decide how they will pay for them. By the same token the schools are provided for the people—for their children and their community. And after all the best technical advice has been given, those communities, those states, that nation in which the people have shared in the planning—, each at the appropriate government level—will stir themselves to pay for good educational plants. American people can catch a vision. The community which has found its needs, together, will find ways of meeting those needs.

CHAPTER 13: Then—Now—Eventually



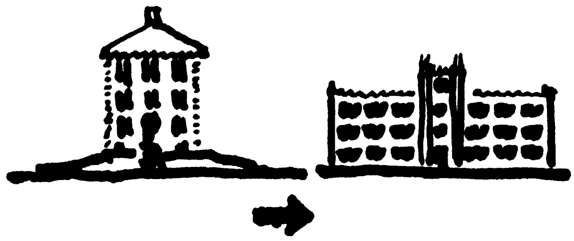
The school board and the contractor "planned" the school in the 'nineties—then the architect was consulted. As schools became more complicated, the superintendent entered the planning. Courtesy *The School Executive* January 1949.

School plant planning has changed—plenty—in the last seventy-five years—for the better we think.

The school plant in America has evolved largely through the influence of a changing philosophy of the purpose and program of the school, and a similar development in thinking and resulting design, aided and abetted by remarkable progress in all phases of technology.

The story of school architecture in America almost parallels all the various architectural trends which have left their impression on our communities, but not quite. When it was fashionable to borrow from the Greeks and Romans, schools borrowed from the Greeks and Romans. When Victorian jig-saw gingerbread became fashionable, schools put on a party dress of Victorian jig-saw gingerbread. As community enterprises, they were made into monuments by a post Civil War generation which had yet to learn that monuments are remembered only by pigeons. The ambition toward bigness resulted in the construction of many huge warehouses such as the Lane Technical High School in Chicago, which was built to accommodate, if that is the proper word, 8,000 students. The ornate Neoclassicism which was made popular by the Columbian Exposition in 1893 threw American architecture behind its own goal line, and its absurd Eclecticism was commemorated throughout the land in imposing and impractical schools.

It is a strange commentary on architecture in general that the very period of the Columbian Exposition saw the development of the great Mesabi iron lode in Minnesota—the tapping of a resource of iron which was to make available and cheap one of the basic materials of contemporary architecture—steel. With new materials and new techniques at hand,



architects continued for decades to build crenelated and castellated copies of ancient Mediaeval and Renaissance masonry monuments.

Nineteenth Century Architecture

In the 1800's, most school boards retired behind closed doors and decided that a new school had to be built. They called in a local contractor who had some books to follow and instructed him to do one like the picture in the book. He was a practical soul and he knew what was needed. After all, schools were pretty much alike.

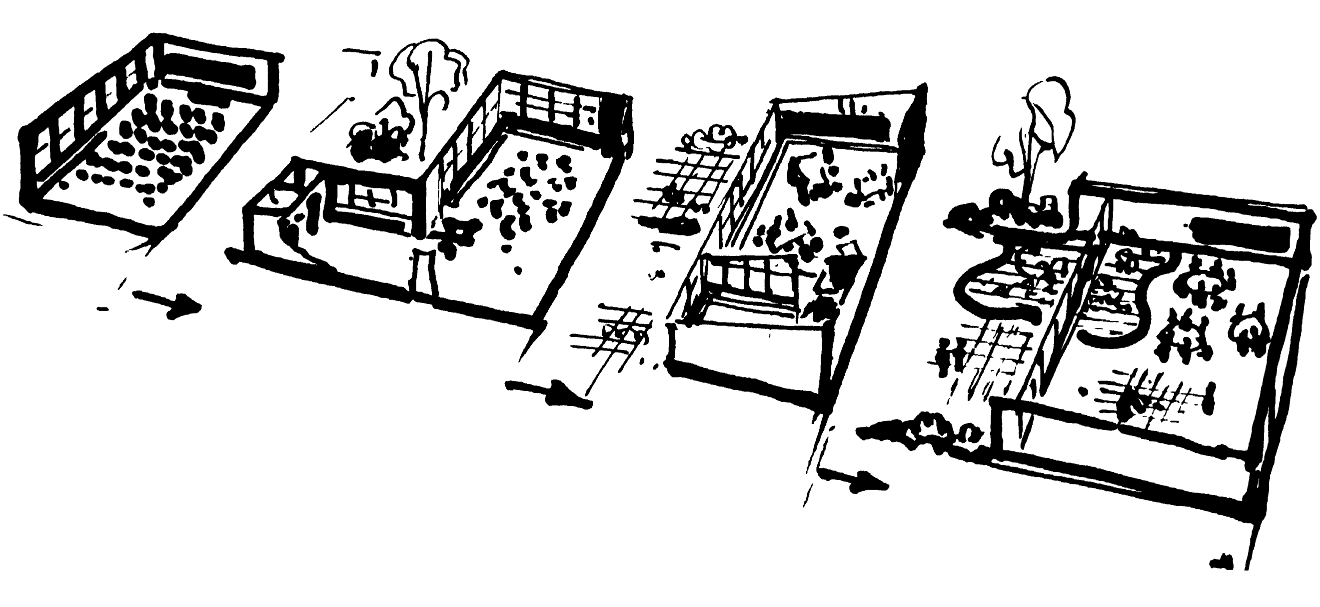
The building needs of the educational program in the 19th century were relatively simple. And anyway technology had not yet found the answers to improved sanitation, lighting, heating, and other matters.

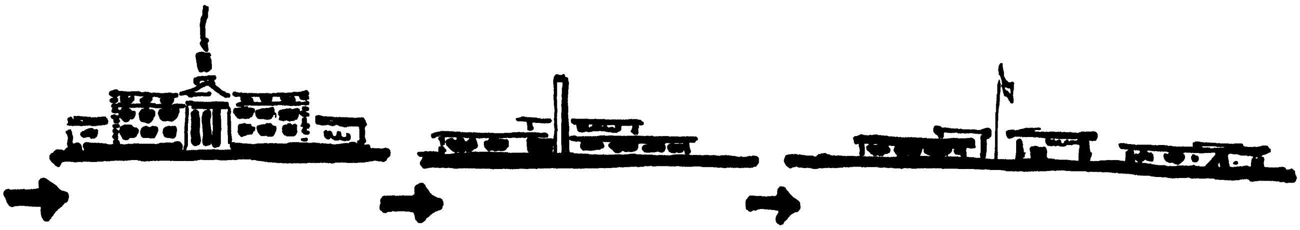
Schools had an objective job in those days, —to teach reading, writing, spelling, and arithmetic, to enforce obedience, and to inculcate moral precepts. Anything more was considered unnecessary. The method of that day has been described as the cistern type,—the teacher pouring knowledge into the heads of his pupils. Such a program required a simple type of building, chiefly space for fixed benches and a teacher's desk at the front plus a space to hang wraps. Not much else was needed.

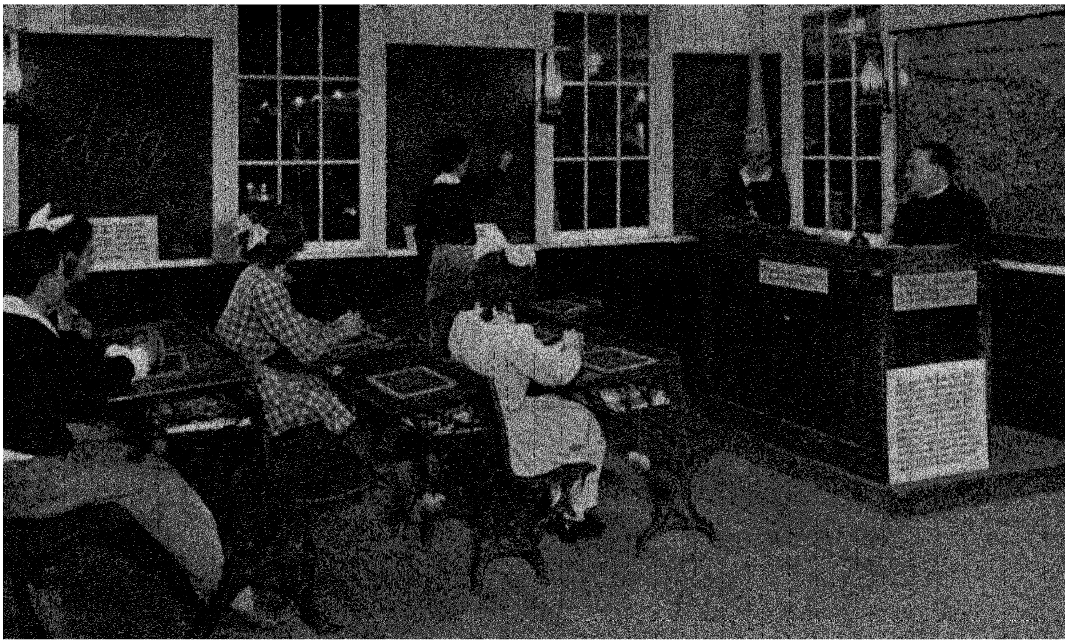
But "frills" began to appear. Parents wanted their sons to take manual training and their daughters to learn cooking. Not only frills but sheer size due to the growing importance of the times made the planning problem more complex, enough to bring architects into the picture—albeit apologetically and through the back door of aesthetic exterior decoration. Programming consisted of a statement that the building should have so many rooms, that so much money (too little) was available.

Nevertheless, these early school buildings were not altogether bad, even though they were usually designed for the pride of the community and not for the education of the children. They at least were planned around the classroom. The usual unit was, in effect, a box containing two or four classrooms, separated by a corridor. Ceilings were high, and high, narrow windows allowed considerable daylight to enter. No one expected a school building to be used during the dark hours, so artificial illumination was a necessity only for the janitor.

Fire hazards, particularly in buildings of two or more stories, were plentiful, and the fire drill was as much a part of the curriculum as reading, writing and arithmetic. Toilets were alfresco and continued to linger outdoors even after sewerage systems had be-

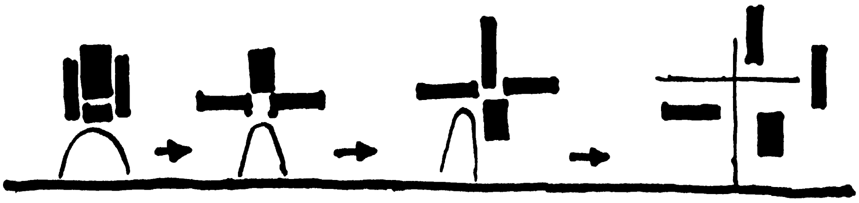






It's not only the plumbing and lighting that is different. The raised desk and silk hat mark yesterday's teacher and how he taught "Activity" meant going to the well or tending the fire. Fred Hess & Son photo. Courtesy American Seating Co.

Schools and their grounds were not for playing, but just the place for Arbor Day and other ceremonies. Arbor Day, painting by Doris Lee, reproduced with permission of *American School and University*.



come commonplace.

Early 20th Century Architecture

The idea of relating a building to its job was not new in the early 1900's but more was done about it. It became more accepted to ask the superintendent to sit in to say what was needed to do a job. After all he was there all day and should have some ideas. So by 1910 planning by board, architect and superintendent was standard practice although a strong, strong bias toward the "practicality" of businessmen and contractors still lingered, and still does.

A few educators and architects began to rebel against the risks and inefficiencies of the buildings in which America's children were spending an important part of their lives. They applied themselves to the problems of increased safety; they improved sanitation, reduced class size, and eliminated other obvious inadequacies of 19th century schools. Their agitation made sense, and civic leaders slowly saw the light. Gradually the average class size shrank from 45 to 35. The danger of poor lighting was recognized, so without sufficient evidence standards were set up which provided that natural light should come from one side of a classroom, the left. Ceiling height was declared to be most desirable when it was half the width of the room. The classroom became standardized on dimensions of 22, 24, 26 by 30, 32 or 34 feet—dimensions dictated by the size of the class and by the fact that the class was still regimented into fixed rows of desks and seats.

For safety against the hazard of fire, the one-story school became acceptable. Where, for reasons of site, the building must be two or more stories, the use of non-combustible materials was strongly urged. These thinkers and planners made specific studies and recommendations concerning the steepness of stairs, the size of stair wells, the width of corridors, the width of doors, and the amount of fenestration each room should require. Their work in New York, Chicago, St. Louis, San Francisco, and smaller places furnished a flood of plans and buildings which aroused communities all over America to a more realistic approach to school architecture. The planning and designing of schools during the 1900-1930 period showed many improvements. But schools were still characterized by standardization, topped with lavish front. Progress had not yet reached the point where the school building was designed for its pupils, tailor-made for its site and built to serve the community with utmost efficiency.

Functional Planning Developments

Yet some of the progressive thinkers began to visualize the design and construction of school buildings into dynamic educational machines, the adaptation of the educational thinking of John Dewey and his disciples to physical forms of brick and steel and wood and glass. This was a reaction from the attitude, still widely held, that the school is a warehouse for the efficient storage of children, under the care of polite and well educated baby sitters.

The regimented and static-desk-teacher relationship began to be replaced by informality, with mobile furniture adaptable to group discussion or project work and a varied stock of accessory facilities for painting, making toys, models, furniture, presenting plays, learning by doing.

Among the exciting developments which began to be felt in the first quarter of the 20th century which led to fundamental changes in the entire school program were: growing acceptance that children learn to do by doing; schools should help children to live better now than in some future day; pupils should have the opportunity to understand the environment in which they live; how to live with others has to be learned; schools have a stake in teaching how to make a living; music, arts, and handicrafts may be as important as reading and arithmetic; mental development is dependent in large measure upon proper health and physical development; learning to work together in groups is a necessary part of one's growth; education is concerned with the whole person and one part affects all the rest; schools are for all the children regardless of social or economic standing; schools are concerned primarily with present-day problems not alone those of the past; adults can learn as well as children, and their education is never completed; and finally the dawning understanding that the school exists to make communities better, not just to teach knowledge.

Such developments brought tremendous changes. More and more pupils came to schools and remained there for years. School programs were expanded to include provisions for teaching, health, physical education, arts and crafts, music, shop work and trades, science of all kinds, agriculture, homemaking, and other things. Hot lunches at school began to win acceptance and approval. Adults demanded that the school provide a program for their needs. And thus the school became quite a different type of institution.

At the same time, important discoveries and advancements in technology were taking

place. Modern plumbing, heating, and ventilation were becoming practical and feasible. New uses were found for old materials, and new materials were being produced. Electricity had developed to such a point that it was a cheap source of energy. Electric lighting and electric gadgets of many kinds were available.

Thus the architect had new tools with which to work, and more important he had an entirely different problem to solve, for the evolving program of education was something new to this world. It had no counterpart elsewhere. So confronted with the new problem and with many new technological devices with which to work, a few architects set to work to design a new type of school plant. At first their experiments drew the blasts of the critics from within and without the profession. Most of the experiments worked, and as better and better results were secured people liked what they saw.

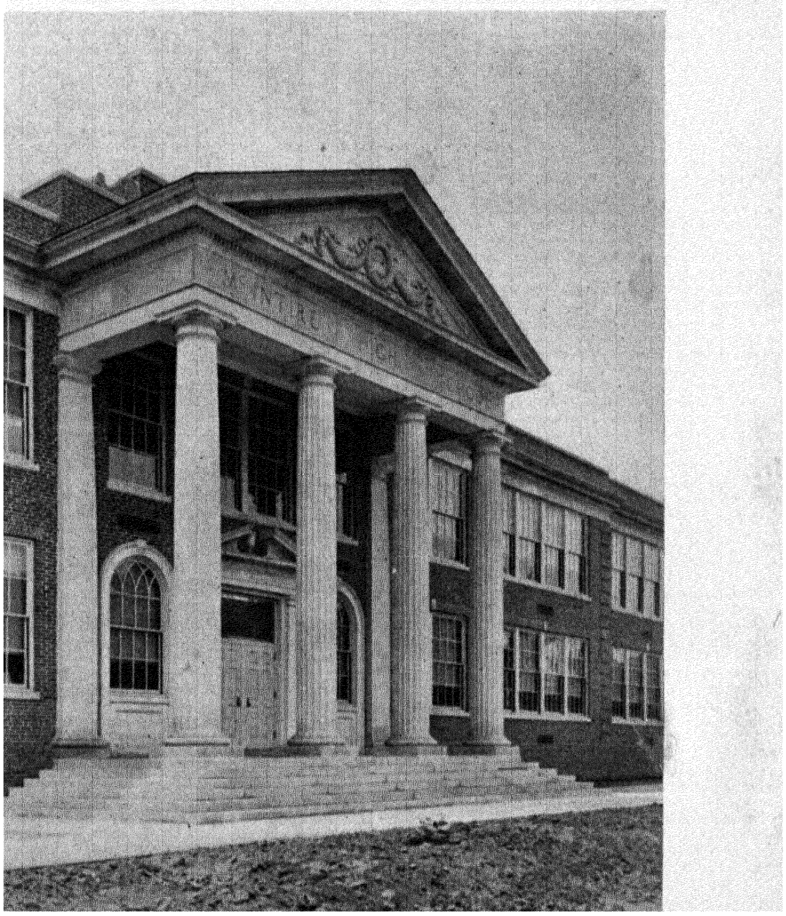
The depression of the thirties gave people time to think and the compulsion to find new "plusses" to survive in a competitive world. This had its reflection in the greatest realignment of planning thought since schools had become major buildings. The mounting complexity and worship of mere bigness of the twenties had run its course under board plus architect plus superintendent in that order. Their monuments were a burden on the foundations both physical and financial. How could such inhuman travesties on places dedicated to the improvement of living be mitigated?

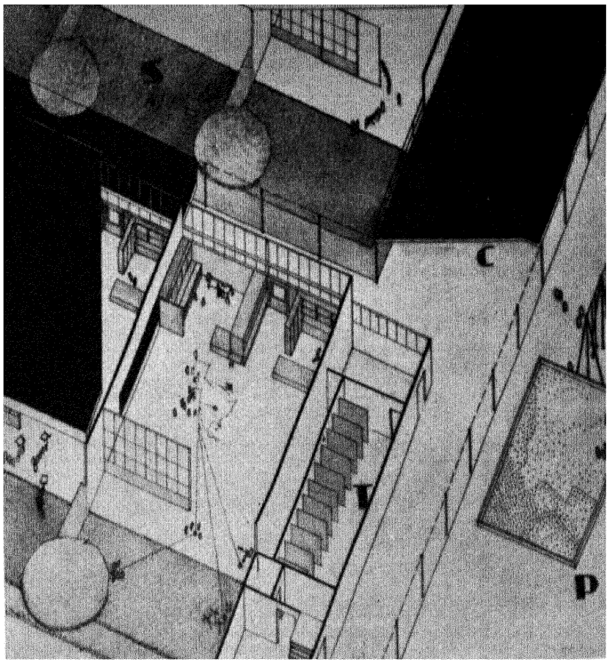
Building had not quite stopped, but had slowed down to a point where plenty of time and plenty of motive were available to try to extract the ultimate effectiveness out of every brick. The source? Who but the people who knew the need? A few gifted superintendents led the quest for better planned buildings back to teachers, custodians, technical consultants and in more instances to children themselves. They knew what they needed, and sometimes they knew the jobs that were not being done for lack of proper planning. They were added to the former team, and synthesized a high standard of service for better buildings.

One of the early notable attempts to build a school for the pupil was the Ansonia High School in Connecticut, designed by William Lescase and Vernon Sears in 1935. It shocked a few people because it was "modern," which simply means that it was built efficiently for efficiency, without froufrou. It was functional. It served its greatest purpose, perhaps, in stimulating educators and architects throughout the world.

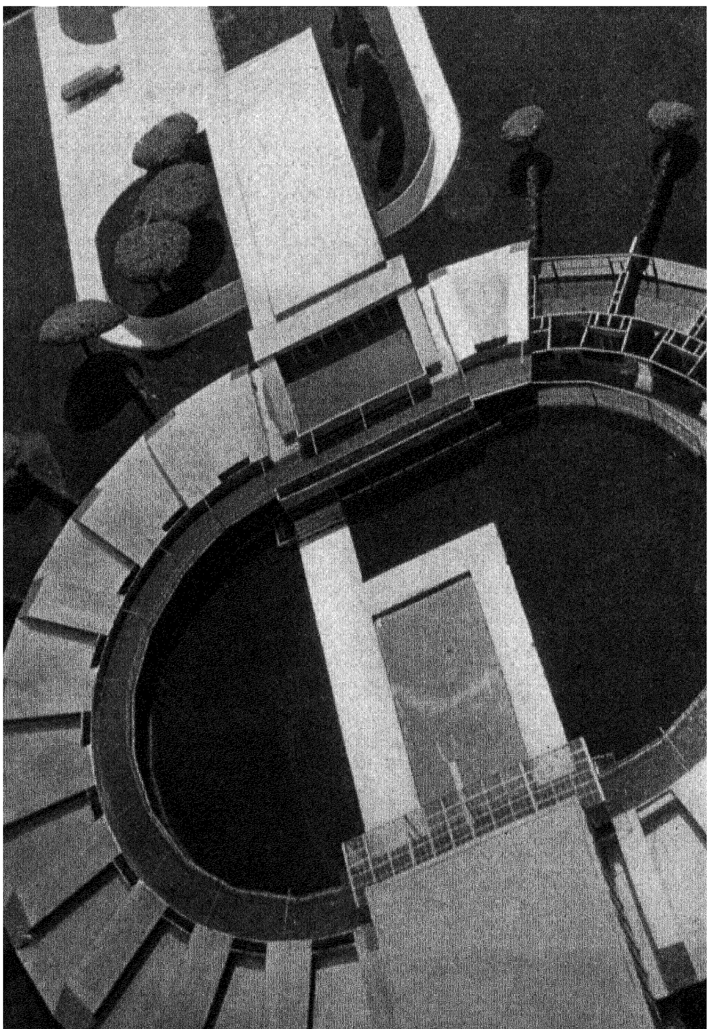
The Plains Elementary School in Portsmouth, N. H., has stood the tests of time—as a structure. Housing 30 children in 1845, it held 51 during the last war. Federal Works Agency photo by Wilson.

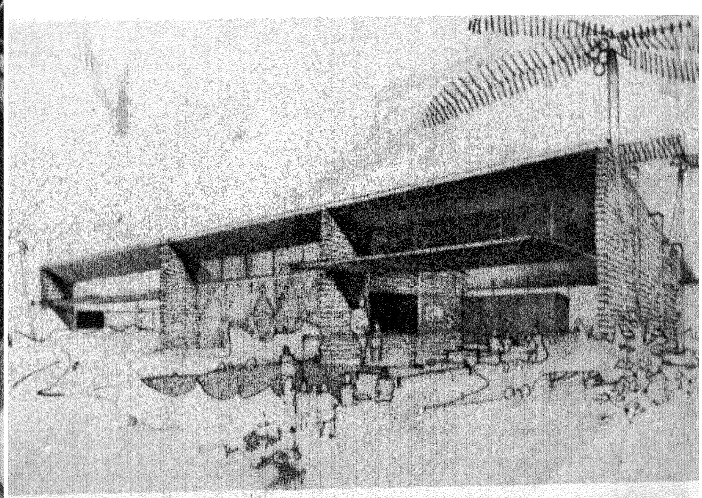
Improvements in heating, plumbing, electricity, and materials all made better buildings, but awesome monuments rather than educational tools. McIntire High School, Charlottesville, Va.

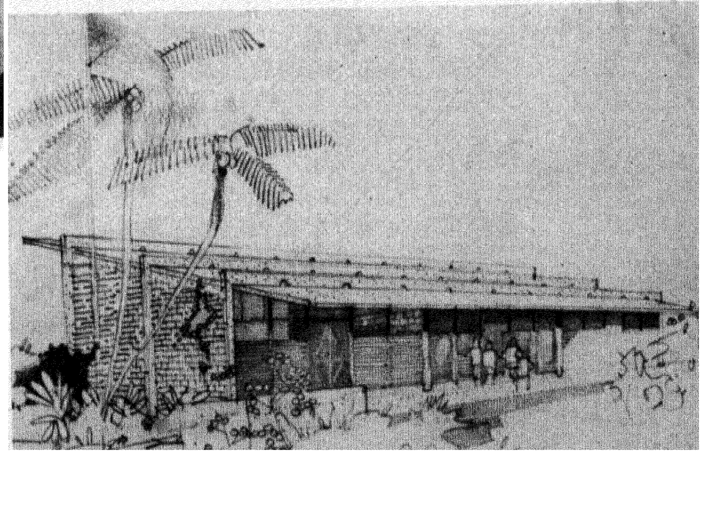




Above, Richard J. Neutra's design for a classroom for today's educational program. The "Ring Plan," left, is Neutra's solution to one theoretical school problem. Below, Neutra, again. This time on a design solution for a Puerto Rican rural school.

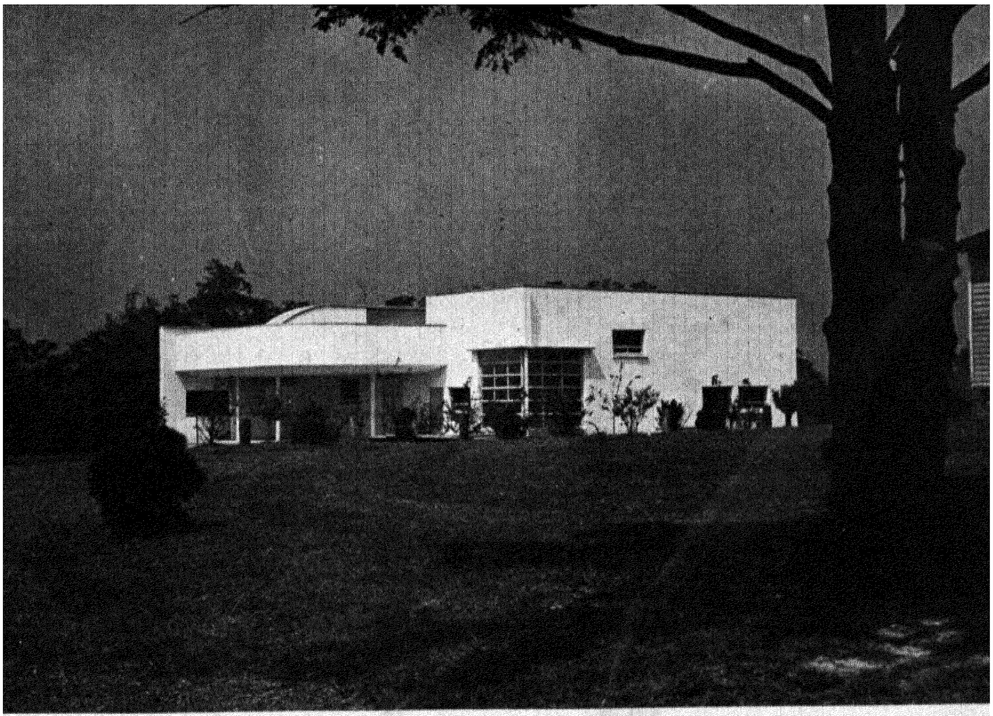


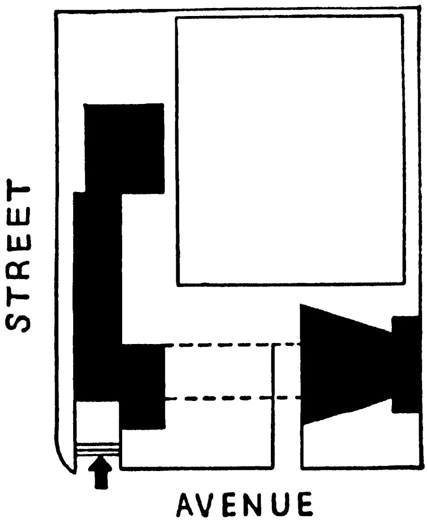


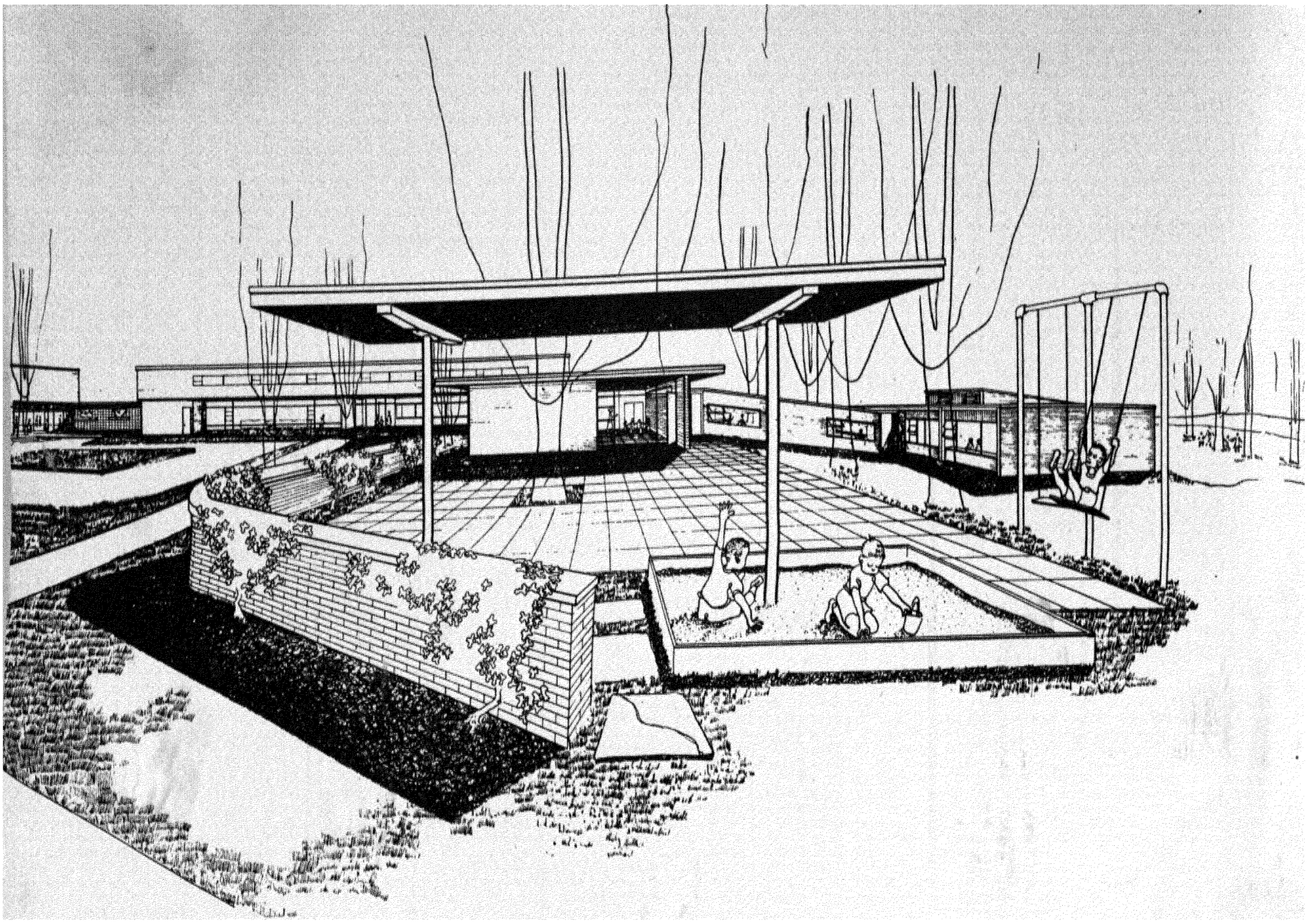


Right, above. Oak Lane Country Day School, Philadelphia. Howe and Lescaze architects.

Below. Ansonia High School, Ansonia, Conn. Lescaze and Sears architects.

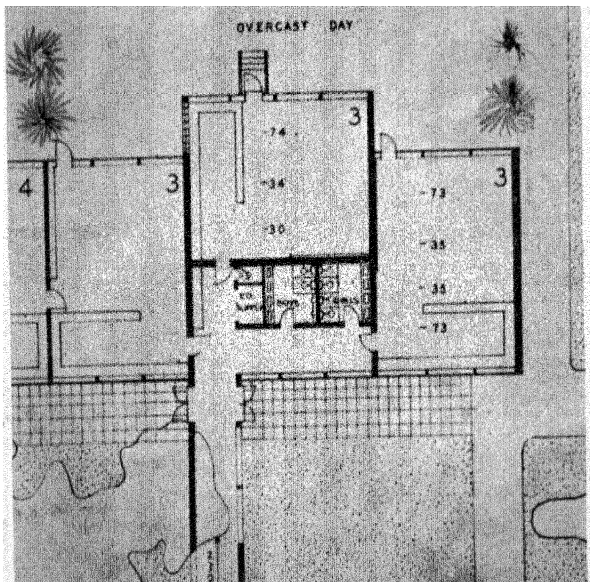




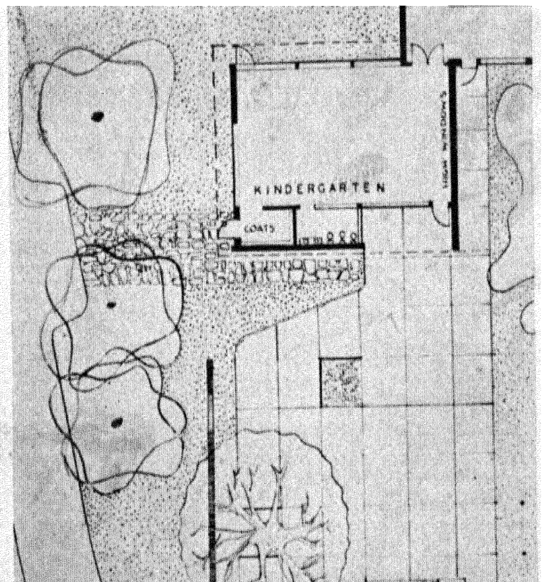


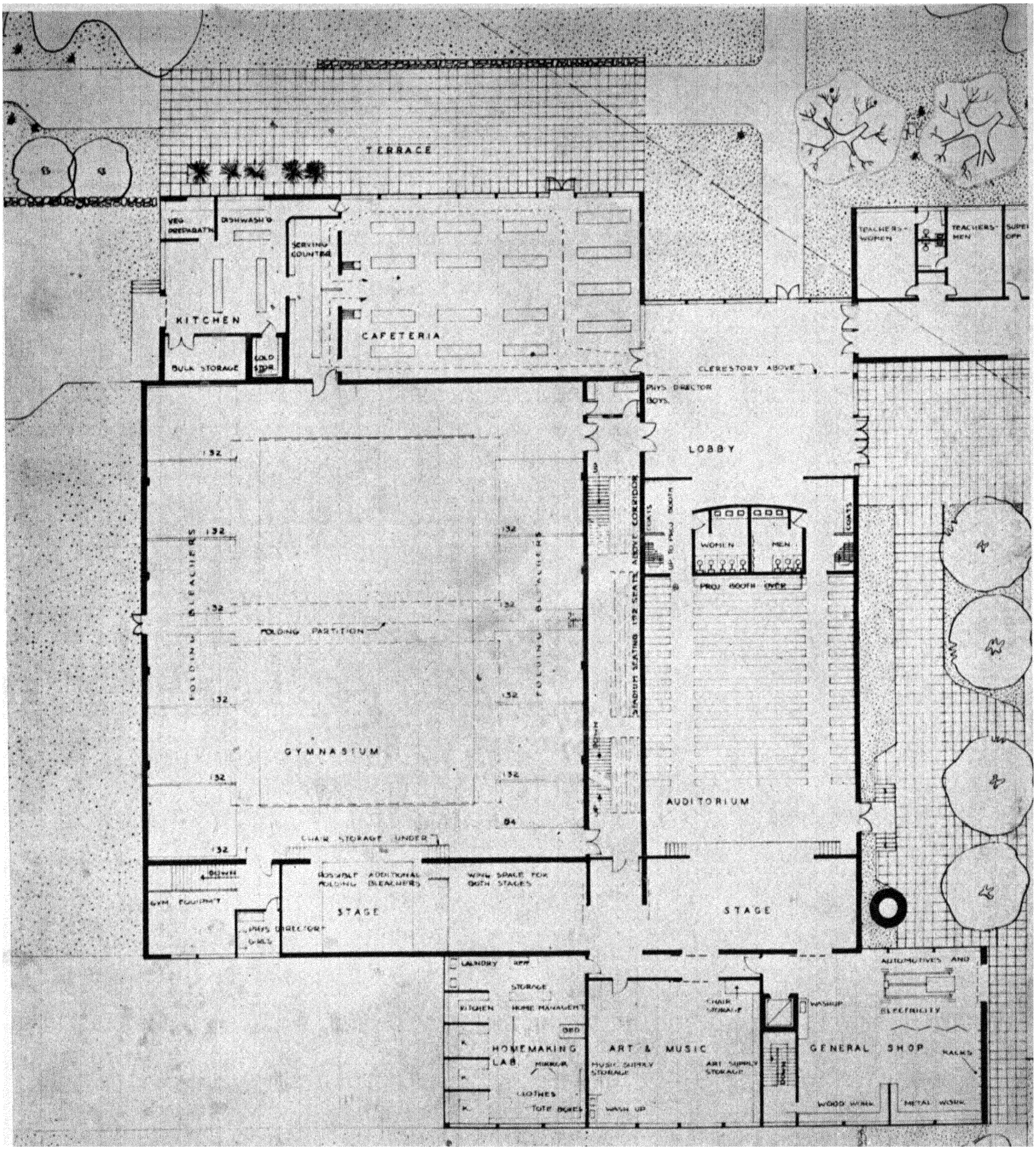
Kindergarten wing of a proposed school submitted for the Attleboro Competition by Walter Gropius.

Interesting classroom arrangement. Note probable light meter readings for various locations within room.

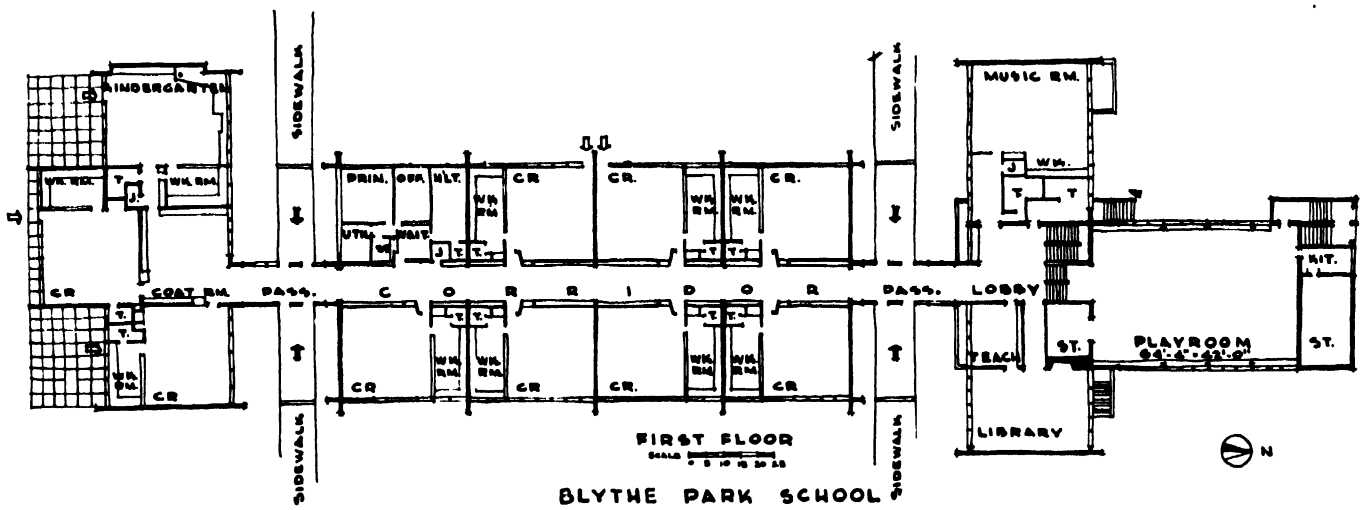


Plan of the kindergarten wing shown above.

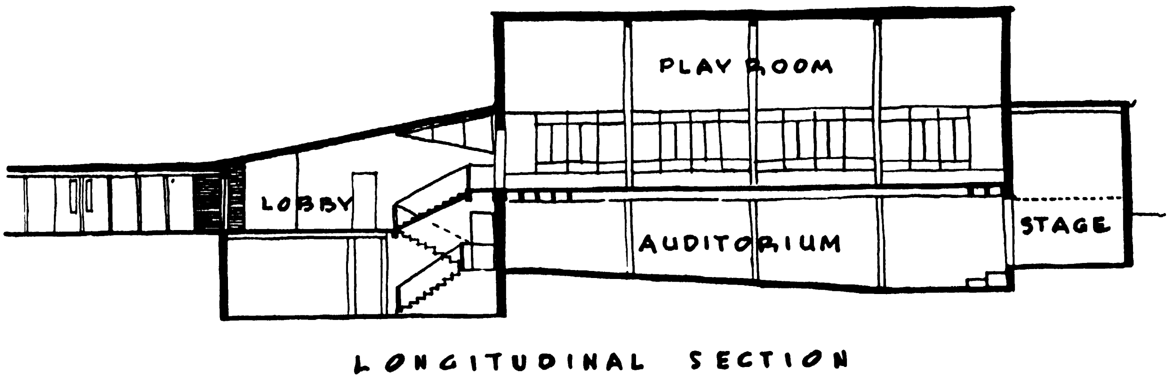




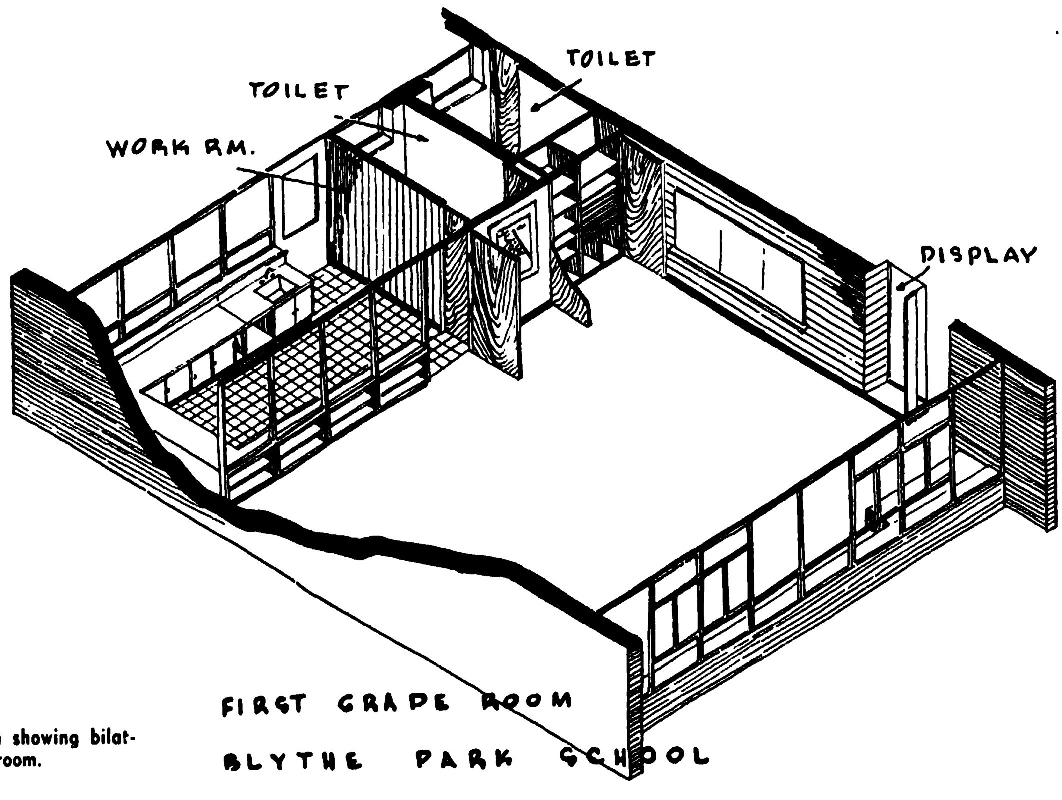
The cafeteria, auditorium and gymnasium with the special rooms relating to them are grouped as a unit so as to provide easy control and the economy of the common use of lobby space. They can be used all at one time or individually without involving the rest of the building.



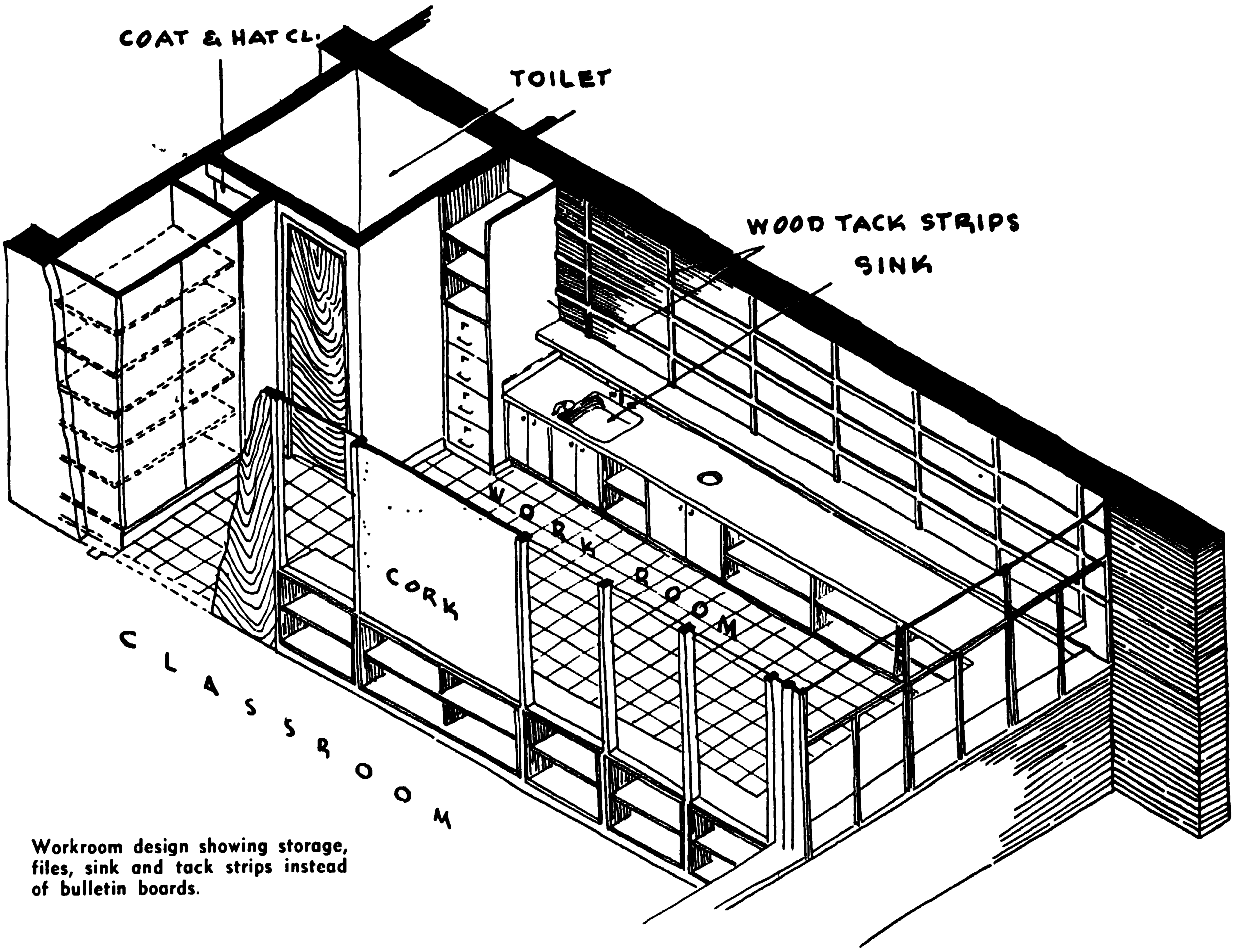
Plan showing the segregation of little children and their play area from older children and their play yard from the community center part of their building. Blythe Park School.



No auditorium-gymnasium here: little theater or visual-aids room separate from the active play room above.

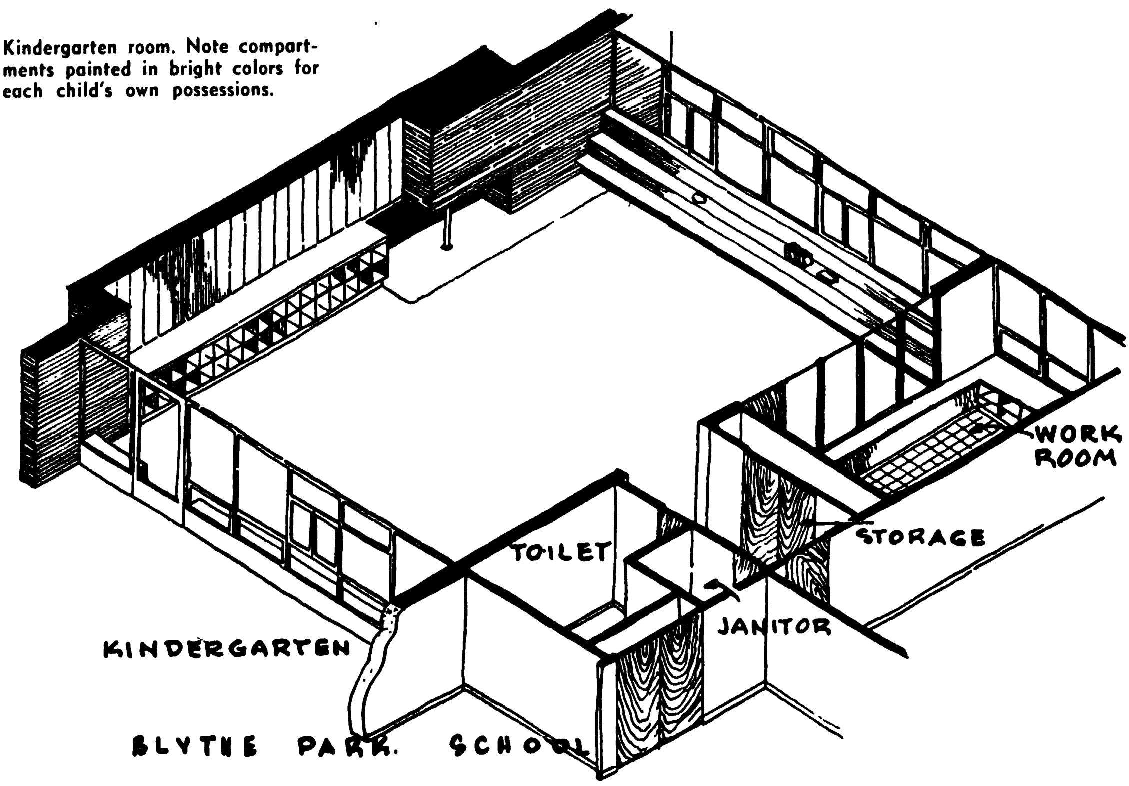


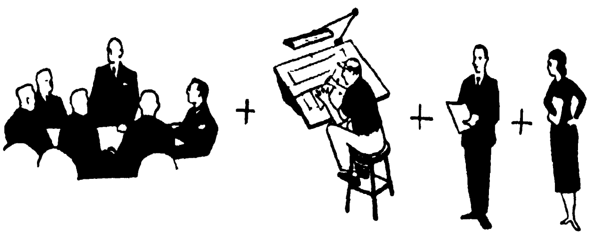
A first grade room showing bilateral lighting work room.

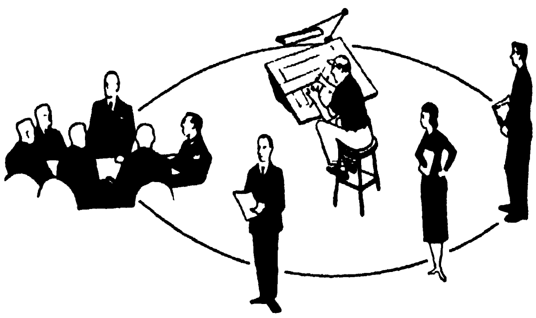


Workroom design showing storage, files, sink and tack strips instead of bulletin boards.

Kindergarten room. Note compartments painted in bright colors for each child's own possessions.

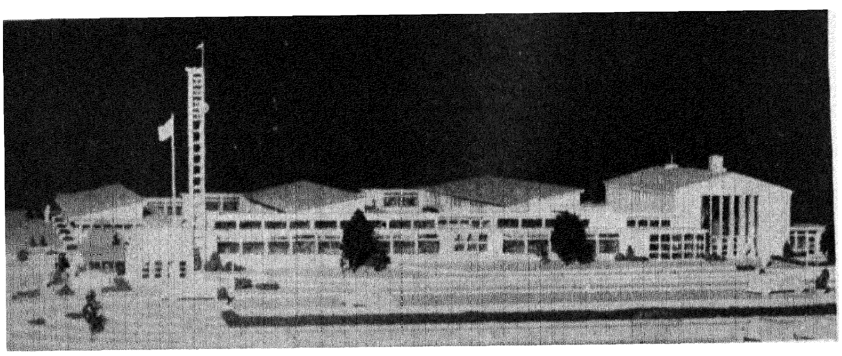






Still later, it was discovered that teachers and others who used the school could contribute to wise planning. Today some, tomorrow all schools will be cooperatively planned—and better suited to the jobs a school must do. Courtesy *The School Executive* January 1949.

Today's architect builds, models and designs each piece of the whole for its own particular job. Edison Elementary School, Pullman, Wash. Model by Funk, Mollander, and Johnson architects.

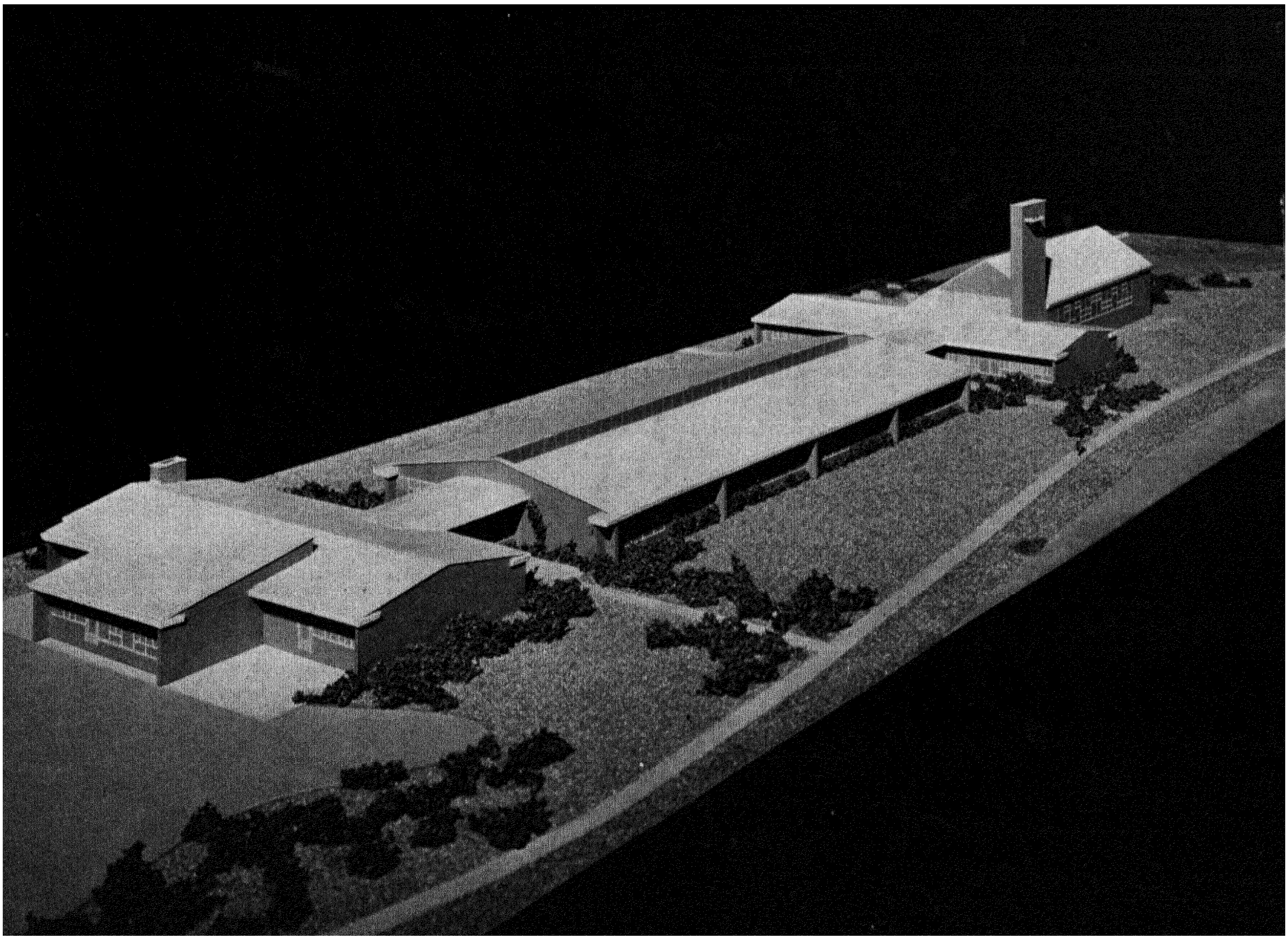


1930 to 1950

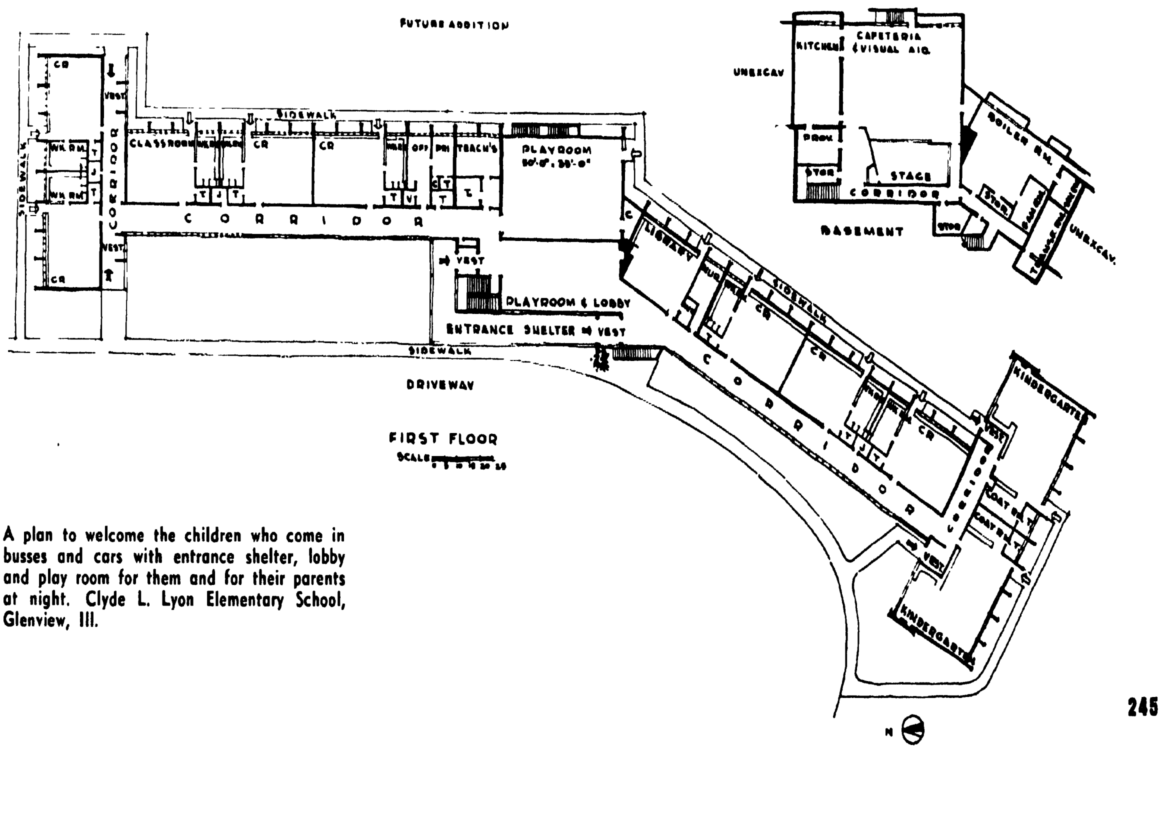
Also the depression of the 30's gave pocketbooks, both personal and civic, a pretty grim drubbing. But in its stagnant years, when most new construction consisted of government projects which put thousands of men to work, idleness gave a few architects time for meditation, a re-thinking of the whole problem of school building design along functional lines. New ideas and new approaches sprouted from the new architecture of old countries—England, France, Sweden, Germany, Switzerland—captured the imagination of planners and builders. Strangely enough, this exciting new functionalism had been an export commodity developed in this country decades before by such pioneers as Sullivan and Wright. Thus was developed a tonic which resulted in straighter and more realistic thinking, not only about school architecture but about the program of the school. Architects and educators envisioned rooms built in scale with their occupants, rather than rooms of impressive monumental size. They sought the greater use of color, discarding the synthetic dirt tones which had characterized public buildings for ages. They sought to fit each building into its surroundings, make it a dramatic and integral part of its site, of its neighborhood, of its community.

Adults in the community have always used schools more or less. Interested parents have met with teachers for generations. It remained for the idleness of the thirties, the group efforts of the war years, and the leisure of the postwar short work week to make the neighborhood and community school center come alive. A group of G.I.'s who petition to use the gym for basketball, a group of young married people who petition to use the cafeteria for a fortnightly dance, a group of white collar workers who petition to use the shop for hobbies are the realities behind the phrase "community users of school facilities." The reality of "community planning" is the channeling of these pressures and these petitions into an investment of thought in the building itself and into community support for its erection. This is happening everyday as of 1949. If this trend continues (and it should) the school plant of tomorrow truly will be the result of cooperative planning and effort by the board of education, architect and engineer, professional school staff and people of the community.

What needs does a community have which a school might help meet? What kinds of programs and services are called for? What plant facilities should be provided? The an-



Community center play room, little theater, library, music room, and teachers' room which can be operated separately from the classroom area. Perkins & Will architects. Hedrich-Blessing photo.



A plan to welcome the children who come in busses and cars with entrance shelter, lobby and play room for them and for their parents at night. Clyde L. Lyon Elementary School, Glenview, Ill.

swers to these questions require much information, and the help of many different people. The alert community today seeks its solution to its school building problem by finding answers to the above questions. No one or two persons have all the answers. Rather the combined effort of the people of the community aided by the most expert educators, architects, and other technicians must be marshalled if an adequate solution is found.

Much remains to be done. Some communities have not yet seen the light. Others are proceeding falteringly. But progress is being made. What of the future? Who knows? Who can predict with any certainty? Judged by past developments, changes in school plant design will be greater in number and more radical in character from what exists today than most of us have the vision to foresee or the courage to foretell. We think a few changes are self-evident. Sites on which school buildings are built will be much larger. We will think in terms of tens of acres rather than one to five acres. More and more the general recreational and community needs will be coordinated at the public school, the one property in every community which belongs to all the people.

Instead of one building under one roof, we foresee that most new school plants will consist of a series of simple structures each designed to carry out one particular function. Such a plant will increase the efficiency in carrying out a program, and will ultimately be cheaper to build, maintain, and expand.

Multi-story school buildings will belong to the ages. The one-story building for all purposes will become the accepted type. It will provide greater safety, greater efficiency, and will be cheaper to build.

Structure will be simpler, lighter, more durable and more aesthetic. Ways will be found to leave more of it exposed and its rugged and natural character will give beauty to the entire building. Air conditioning of all buildings will become common practice. Improvements in lighting and sound control will be far beyond anything we know today.

More space will be provided for each activity. Rooms will be wider not only because more nearly square spaces give greater utility, but also because spaces with wider spans cost less to construct. The principle of modular coordination will govern the manufacture of all building materials making all parts interchangeable, and greatly decrease the labor cost of construction.

All buildings will provide for a greater degree of flexibility. It will be possible to change interiors almost at will and with the expenditure of a minimum of time and labor. Spaces will be designed so that they can be efficiently used for various activities. Equipment will be interchangeable. Little of it will be fastened to the building. Storage space will be expanded and more attention devoted to its design.

Finally, the school plant for tomorrow will be a thing of beauty. We will learn that utility and beauty are always compatible. One need not be sought at the expense of the other. The school plant will be the place to which all paths in the community lead for relaxation; for work; and for sheer enjoyment.

Probably the most important future development with respect to school plants will be greater and more intelligent use of cooperative planning. Intelligent teamwork involving representatives of the community, the professional staff, architects and engineers will become the usual procedure. Cooperative planning requires expert leadership; and it takes time, patience and vast understanding. America will learn how to do it, and the result will be better school plants than can be secured in any other way.

CHAPTER 14: Where to Look Further

Anyone who is concerned with educational plant planning, design, and construction is always in need of information. The authors of this book have drawn upon a great deal of information in their studies and in the preparation of these materials. It is felt that our readers will want additional information on many of the issues and problems we have presented. And so, this section is presented to suggest to those who would have more information where to look to find it. In the bibliography which follows, we have made no effort to be complete. Only references are listed which we believe are authentic, helpful, and rather readily available. For ease of use a classification of topics has been followed with a selected listing of materials under each heading.

General Books

Bursch and Reid, **So You Want to Build a School?**, Reinhold Publishing Corporation, New York, 1947. 128 pp. $3.50
Emphasis of this book is on group effort of school planning and building program.

Caudill, W. W., **Space for Teaching**, Bulletin of the Texas Agricultural and Mechanical Arts College, College Station, Texas, 1941. 124 pp. $1.00
One of the best and most forward-looking publications on the school plant. Must reading for school people and architects.

Donovan, John J., **School Architecture.** Macmillan Co., New York, 1921. 724 pp.
While out of print, we list School Architecture *because it was the advanced book of 25 years ago. Look it up in the library.*

Commission on American School Buildings, **American School Buildings**, American Association of School Administrators, N.E.A., Washington, D. C., 1949. 341 pp. $4.00
A general analysis of school plant problems by a distinguished committee of schoolmen.

Engelhardt, Engelhardt, and Leggett, **Planning Secondary School Buildings.** Reinhold Publishing Corporation, New York. 1949. 320 pp. $10.00
A comprehensive treatment of problems in planning secondary school buildings.

Fitch, James Marston, **American Buildings.** Houghton Mifflin Co., New York, 1948. 382 pp.
The outstanding book on architecture today.

Rand, Ayn, **The Fountainhead.** The Bobbs-Merrill Company, Indianapolis. 1943. 754 pp. $3.00
A best seller for three years. Its theme song is the age old battle between recreating the past and meeting today's and tomorrow's needs.

Sullivan, Louis H. **Autobiography of an Idea.** Press of the American Institute of Architects, New York. 1924. 328 pp.
A challenging and forthright presentation which will help us all to think clearly and act our best.

Wright, Frank Lloyd, **When Democracy Builds**. The University of Chicago Press, Chicago. 1945. 132 pp.
Frank Lloyd Wright at his best. Don't miss it.

Agencies

Help on special problems may be available at some of the following agencies:

American Council on Education, Committee on Educational Buildings and Equipment, 744 Jackson Place, N. W., Washington, 6, D. C.
Have published four reports—one in 1948 on Things to Consider in Planning Educational Plants, 1948, 13 pp., 25¢. Has a Permanent Committee on Educational Plants.

American Institute of Architects, 1741 New

York Avenue, N. W., Washington 6, D. C. *The national organization of the architectural profession. March 1947 Bulletin included 323-item Bibliography Reference Guide on School Buildings.*

Interstate School Building Service, George Peabody College for Teachers, Nashville 4, Tennessee
Offers consultative services to state, county and local school units. Issues some material dealing with specific plant problems. Particularly helpful on smaller school plant problems.

National Council on Schoolhouse Construction, George Peabody College for Teachers, Nashville 4, Tennessee
The major national organization dealing specifically with problems of school plant planning. The 1948 Guide for Planning School Plants (Revised), published in 1949, is a major contribution to the field.

National Recreation Association, 315 Fourth Avenue, New York 10, N. Y.
Consultative and informational service to school plant planners in the area of recreational use.

New England School Development Council, 13 Kirkland Street, Cambridge 38, Mass.
An association of public school systems which publishes pamphlets in this field from time to time.

U. S. Office of Education, Federal Security Agency, Washington, D. C.
Publishes pamphlets, articles, and bibliographies, often in School Life, *the Office monthly magazine. Provides some consultative services.*

Bibliographies

American Association of School Administrators, Commission on American School Buildings. **Appendix A—Selected References.** American School Buildings. 27th Yearbook: 325-41; 1949. $4.00
197 references, both recent and available, selected as applicable to particular topics discussed in the yearbook.

American Institute of Architects, Department of Education and Research. **Building Type Reference Guide No. 1: The Public School Building.** Bulletin of the American Institute of Architects 1:39-50; March 1947.
Available also as a reprint.

American School and University. **School Plant Bibliography.** The American School and University, 1947-48 and also 1949-50. New York: American School Publishing Corporation, 470 Fourth Avenue, 1947 and 1949.
Also available as a reprint. Selected references.

Smith, Henry Lester, and Eaton, Merrill T. **Bibliography of School Buildings, Grounds, and Equipment,** Part VI, Bulletin of the School of Education, 21:5, Bloomington, Indiana: Bureau of Cooperative Research and Field Service, Indiana University, 1945. 73 pp. 50¢
The latest in a series started in 1928; an exhaustive bibliography.

Current Periodicals and Yearbooks

Monthly magazines in school administration most helpful to those planning school plants include:

The School Executive, Walter D. Cocking, Chairman of Board of Editors, American School Publishing Corporation, 470 Fourth Avenue, New York 16, N. Y. $3 yearly.

Nation's Schools, Arthur Rice, Managing Editor. The Nation's Schools Publishing Co., Inc., 919 North Michigan Avenue, Chicago 11, Illinois. $3 yearly.

American School Board Journal, William G. & William C. Bruce, Editors, Bruce Publishing Company, 540 North Milwaukee Street, Milwaukee, Wisconsin. $3 yearly.

School Management, George J. Hecht, Publisher, School Management, Inc., 52 Vanderbilt Avenue, New York 17, N. Y. $2 yearly.

Architectural journals published monthly which are most helpful include:

Architectural Forum, Douglas Haskell, Architectural Editor, Time, Inc., 19 West 44th Street, New York, N. Y. $5.50 yearly.

Architectural Record, K. K. Stowell, Editor, F. W. Dodge Corp., 119 West 40th Street, New York, N. Y. $3 yearly.

Progressive Architecture (Pencil Points) Thomas H. Creighton, Editor. Reinhold Publishing Corp., 330 West 42nd Street, New York, N. Y. $4 yearly.

The yearbook which is wholly devoted to school and college plants is:

The American School and University, Walter D. Cocking, Editor, American School Publishing Corporation, 470 Fourth Avenue, New York 16, N. Y. Published yearly $4.00. Twenty volumes in the series up to 1950.

Guides (See also Manuals)

Elliott, Eugene, **A Guide for Planning School Buildings,** Lansing, Michigan: State De-

partment of Public Instruction, 1945, 147 pp.
Planned to inform and stimulate rather than control Michigan school plant planning.

National Council on Schoolhouse Construction, **The 1948 Guide for Planning School Plants** (Revised). Peabody College, Nashville, Tennessee, 1949. 173 pp. $1.25
The long-awaited revision of the Council's statement of objectives for the school plant, in detail by spaces and functions.

Whitehead, Willis A., and others. **A Guide for Planning Elementary School Buildings.** Columbus, O.: Bureau of Educational Research, College of Education, Ohio State University, 1947. 130 p., $2.00.
Proposals for planning school plants indicating particular studies which should be made.

Manuals

Engelhardt, N. L. **Building Manuals for School Systems.** The American School and University, 19:48-51, 1947-48
Defines a manual and its purposes.

Engelhardt, N. L. and others. **Manual of School Planning.** New York: Board of Education of New York City, Publications Office, 110 Livingston Street, Brooklyn 2, N. Y. Third Revision, 1947. 113 p. $3.00
The character and materials of construction for New York City schools as determined by the educational program.

Lieuallen, R. E. **A Manual for School Building Construction.** Salem, Oregon: Rex Putnam, Superintendent of Public Instruction, 1947. 90 pp.
A manual for laymen, school officials, and architects as they develop Oregon school housing.

Cincinnati Public Schools Manual for Architects 2nd edition. Cincinnati: Board of Education, 1947. 96 pp. $1.50
A careful summary of educational and materials specifications for architects of Cincinnati's schools.

The Nursery and Primary Schools

Haskell, Douglas. **The Modern Nursery School.** Architectural Record 83:84-100. March 1938.
An architect sums up. Illustrations from many countries.

Nichols, John E., and others. **Sites, Buildings, and Equipment,** Ch. IX, 46th Yearbook Part II Early Child Education. Chicago: The National Society for the Study of Education, 5835 Kimbark Avenue, Chicago 37, Ill. 1947.
A complete study of every aspect of plant and equipment for the nursery school.

Elementary Schools—General

Building Types: **Elementary School Buildings.** Architectural Record 85:85-122, February 1939.
Tells and illustrates what the architect should know about elementary schools.

Hamon, Ray L. **Planning the Elementary School Plant of Tomorrow.** The School Executive, 63:50-52, June 1944.
A plea for re-thinking the functions and their housing.

School Buildings and Child Growth, a portfolio by N. L. Engelhardt, Earl M. Towner, John E. Nichols, W. F. Credle. Childhood Education 22:282-303. February 1946
Available as a reprint from the Association for Childhood Education, prepared by competent planners.

Secondary Schools—General

Hamon, Ray L., Herrick, John H., and Eckles, William G. **Planning the Secondary School Plant.** Bulletin of the National Association of Secondary School Principals (Proceedings of the Thirty-Second Annual Convention) 32:202-227. March 1948.
Educational, planning and building guide for the high school plant.

Miller, Ward I. **Requirements of the Modern Secondary School.** The American School and University 20:77-85. 1948-49.
Four trends in secondary education and their implications for plant design.

Community Schools

Community School Facilities, a Planning Section. The School Executive 66:4, pp. 41-58. December 1946.
Presents planned facilities for community meetings, "making and repairing things," reading and research, food service, food preservation, and recreation.

Neighborhood Schools. Architectural Record. July 1945.
Reference studies and time-saving standards in community school buildings.

McCharen, W. K. **Improving the Quality of Living—A Study of Community Schools in the South.** Nashville, Tenn.: George Peabody College for Teachers, Division of Surveys and Field Services. 1947. 68 pp. Single copy gratis.
Plants housing schools that really serve the community are very different from

traditional schoolhouses.

Junior Colleges

Hardesty, Cecil D. **The Junior College Plant.** The American School and University 18:84-90. 1946.
Discusses site, architect, master plans and illustrates two junior college plans.

Carpenter, W. W. **The Junior College Building and Its Equipment.** The American School and University. v. 9, 1937.
Lists activities in junior colleges for which special facilities are needed.

Dent, H. C. **The Village College in England.** The American School and University. 18:75-83. 1946.
Small colleges serve as community centers in England's rural areas.

THE BUILDING SPACES—Arts and Crafts

Winslow, Leon L. **Planning the Art Department.** New York: Related Arts Service, 511 Fifth Avenue. 1945. 10 pp. 15¢
Plans and specifications for a modern art unit.

Auditoriums and Stages

Gillette, A. S., **Planning and Equipping the Educational Theatre.** Cincinnati: The National Thespian Society, College Hill Station; 1945. 31 pp.
The structural needs of a school theatre is shown as these needs grow from its functions. Emphasis on points usually overlooked.

Hare, Michael M. **Dont's for the Secondary-School Theatre.** The American School and University, v. 14. 1942.
How a school theatre may be designed to serve its real purposes.

Nichols, John E. **Auditoriums and Stages.** The School Executive 68:5; 60-61, January, 1949.
Lists fifteen trends in the function and design of the auditorium and stage.

Classrooms

Bursch, Charles; Gibson, Charles D.; Wright, Henry L. **Trends in Classroom Size.** The School Executive 68:5, 58-59. January 1949.
More floor area, more efficiently used, bounded with non-structural partitions make the modern classroom.

Committee of Teachers, Elmont, L. I., New York. **Elementary School Classroom Design and Equipment**—Specifications of Teachers. The American School and University, 18:203-09. 1946.
Teachers who use classrooms tell what kinds of rooms help them do their job better.

Engelhardt, N. L., and Leps, Joseph. **Designing Secondary-School Classrooms.** The American School and University, 14:248-54. 1942.
A checklist of human values and of functions, and a long way from stereotyped high school classrooms.

School Executive Planning Section, **Classrooms for General Purposes.** The School Executive, 66:3; 51-66. November, 1946.
A distinguished group of planners discuss function and design of the general classroom for elementary and secondary schools.

Swanson, Chester, and Hosler, Fred W. **A Classroom For Primary Schools.** American School Board Journal, 116:55-7, January, 1948.
Floor plan, four elevations, and movable cabinets in detail for a primary classroom.

Wooden, H. Z., Wrigley, A. B., and Lowe, W. L. **A Plan For a Social Science Suite.** The School Executive, 54:262-264. May, 1935.
Planning and equipping a suite for social science in the high school.

Custodians' Suites

L. O. Thompson, and Bertram A. Betts, **The Janitor—Custodian's Headquarters.** The American School and University, 19:144-5, 1947-48.
A plan for such a space—office, locker, and workrooms.

Gymnasiums

Luehring, Frederick W., **Swimming Pool Standards,** New York: A. S. Barnes and Co. 1939. 274 pp. $5.00.
Twenty criteria for the planning, construction, operation, and maintenance of twenty pools.

National Facilities Conference. **A Guide for Planning Facilities for Athletics, Recreation, Physical and Health Education.** American Association for Health, Physical Education, and Recreation, N.E.A., 1201 Sixteenth St., N. W., Washington 6, D. C. 1947: 127 pp. $1.50.
The result of two weeks' hard work by a large and varied group in the field.

School Executive Planning Section, **Gymnasiums and Playrooms.** The School Executive, 65:12; 43-56. August, 1946.
Five planners discuss facilities for large and small schools.

Homemaking

Fleming, Mary Owers, **Homemaking Program Determines Building Plan.** The American School and University, 20:150-6. 1948-49.
Describes the procedures in planning the homemaking suite, involving staff, students and community.

Robinson, Anna Belle, and Scheick, William Hunt. **Principles of Planning a Homemaking Department.** Urbana, Illinois: University of Illinois: (Bulletin, vol. 41, no. 44, June 20, 1944), 28 pp. 35¢
Principles and visual aids for planning or remodeling a multi-purpose home economics unit.

School Executive Planning Section, **Building Facilities for Homemaking.** The School Executive, 65:6; 61-72. February, 1946.
Illustrates facilities for small, medium and large schools.

Libraries

Fenner, Phyllis R., **The Library in the Elementary School.** Philadelphia; Hinds, Hayden, and Eldridge, Inc., 1945; 34 pp.
A searching discussion of activities, policies and possibilities prepared for the service center of the American Education Fellowship.

Portfolio on Libraries, Nation's Schools, 33:33-40. July, 1944.
Plans and principles show what constitutes modern design of school libraries.

School Executive Planning Section, **School Library Facilities.** The School Executive, 66:1:59-74. September, 1946.
A series of articles discussing the functions and facilities for elementary, secondary, twelve-year school and individual classroom libraries.

Lunchrooms

Bowie, Gertrude N., **Lunchrooms.** The School Executive, 68:5; 70-71, January, 1949.
Sixteen trends in lunchroom design—and a floor plan.

Nation's Schools Portfolio, **Cafeteria Planning.** Nation's Schools, 39:6; 41-56, June, 1947.
Plans of nine school lunchrooms for various size schools.

U. S. Office of Education. **Planning and Equipping School Lunchrooms.** Bulletin 1946, No. 19: Washington, D. C., the U. S. Office of Education; 23 pp. 10¢
Suggestions for planning and appraising school lunchroom layouts, and a table outlining equipment needs and space considerations.

Music

Best, Clarence J. **Building Facilities for Music Education.** The School Executive, 65:7; 57-72. March, 1946.
Summary of practices. Separate building recommended.

Offices

Reavis, William C., **The Administrative Office in Elementary and Secondary Schools.** The American School and University, v. 10. 1938.
The administrator's conception of his work governs his choice of office facilities.

Science

Byerley, J. Roy, **Planning and Equipping the Science Laboratory.** American School Board Journal, 98:59-62. January, 1949.
Suggestions and plans to facilitate better teaching of science.

Shops—General

Rose, Home Co., and Van Duzee, Ray R. **Planning and Equipping an Industrial Arts Department.** Industrial Arts and Vocational Education, 28:349-56. November, 1949.

School Executive Planning Section, **Shops and Laboratories.** The School Executive, 65:11; 41-54, July, 1946.
Discusses general shops, laboratories, for for social studies, speech arts, functional and fine arts and a science laboratory-workshop. Illustrated.

School Shop for General Education. Architectural Record, July, 1946.
A series of articles and plans illustrating the design of the comprehensive industrial arts shop; for architects, "time saver standards" for school shop equipment.

Teachers' Rooms

Bailey, James H., **Teachers' Rooms.** The School Executive, 68:5; 72-73, January, 1949.
Ingenious, functionally planned space for teacher comfort and efficiency.

Vocational Education

Clements, D. M., Hollenberg, A. H., and Naugher, R. E. **Plant Facilities for Vocational Agriculture**—Classroom and Shop and the School-Community Cannery. The American School and University, 18:161-170. 1946.
Typical plans and hints for adapting them to local needs.

Fries, Albert C. **Building Facilities and Equipment for Business Education.** The American School and University, 18:155-59. 1946.
Includes principles, plans, and equipment lists for high school business departments.

Komow, Maximillian. **The Planning of Vocational Departments in High Schools.** American School Board Journal, 108:1, January, 1944.
Factors in designing and equipping both general and specialized school shops.

THE BUILDING—TECHNICAL AND GENERAL ASPECTS

Acoustical Control

Sound. The Architectural Forum, November, 1948. 126-133, New York. $1.00 per issue.
"Form, dimension, and materials—all in the architect's domain—govern its behavior."

Schwarz, Karl R., **Good Hearing Conditions in Schools.** The American School and University, 19:117, 1947-48.
A moderately technical discussion of ways of improving hearing conditions.

Adaptability

Clapp, Wilfred F., **What We Like About One-Story Schools.** Architectural Record, 103-119-121. March, 1948.
Economy and flexibility as well as educational desirability of the one-story structure.

Clapp, Wilfred F., and Perkins, Lawrence B. **Designing the School Plant for Multiple Use.** The American School and University, 18:69:75. 1946.
Applications of flexibility for within school program and for out-of-school use in most school spaces.

School Executive Planning Section, **Flexible School Buildings.** The School Executive, 65:9; 55-74. May, 1946.
Varying points of view on ways to achieve flexibility—architects local, state and federal office schoolmen.

Stanhope, Allan B. **One-Story Buildings.** The School Executive, 68:5; 37-9. January, 1949.
Flexibility as well as low cost and higher safety as arguments for the low structure.

Audio-Visual

Coelln, O. H., Jr., **Audio-Visual Facilities.** The School Executive, 68:5; 76-77 January, 1949.
Building requirements of an audio-visual program.

Millgate, Irvine H., and Coelln, O. H., Jr. **Standards for Visual and Auditory Facilities in New Educational Buildings.** The American School and University, 18:136-51, 1946.
Definitive statements about both plant and equipment facilities, very well illustrated.

Color

Davini, William C., and others. **Color Planning for School Interiors.** St. Paul, Minn.: The Board of Education, 1948. $2.00.
Principles involved and applications of color for light and psychological rightness.

Heating and Ventilating

American Society of Heating and Ventilating Engineers. **Heating, Ventilating, Air Conditioning Guide,** 1948. New York: The Society, 51 Madison Avenue. 1948.
The whole problem, as the engineers see it.

Essex, Don L. and Gilson, Frank C. **Heating and Ventilation.** The School Executive, 68: 5; 80-1, January, 1949.
A clear simple illustrated picturing of radiant heating and ways to ventilate.

Kump, Ernest J. **Radiant Heating For School Buildings.** The American School and University, 19:100-5, 1947-48.
A proponent cites the history and present applications of radiant heating principles.

Nation's Schools Portfolio. **Trends and Values in Radiant Heating.** Nation's Schools, 40:6; 33-8. December, 1947.
An engineer and a State Schoolhouse Chief discuss principles and report opinions of 65 California architects.

Seagers, Paul W. **Heating and Ventilating a School Building.** Review of Educational Research, 15:51-53. February, 1945.
A summary of research findings on heating and ventilation.

Lighting—Natural

Haskell, Douglas. **Sixteen Ways to Daylighting a Classroom.** Architectural Record. May, 1944.
An illustration of the variety possible in achieving proper seeing conditions.

Kump, Ernest J., **Development of a Natural Daylighting System for Modern School Buildings.** American School Board Journal, 116:6; 35-8. June, 1948.
The evolution of daylight control in California.

Schulz, George. **New Window Design.** The American School and University, 20:138-40, 1948-49.

A report on experiments with glass block in a school building.

Wynkoop, Frank. **Advances in the Art of Schoolroom Daylighting.** Architectural Record. July, 1945.
New materials and finishes, and alternative window arrangements.

Lighting—Artificial

American Standard Practice for School Lighting. Illuminating Engineering Society, 51 Madison Avenue, New York: 1948: 79 pp. 50¢.
Presents new standards formulated by a committee of the Illuminating Engineering Society, American Institute of Architects, and approved by the American Standards Association.

Gibson, Charles D. **School Plant Lighting.** Review of Educational Research, 15:41-50, February, 1945.
Same condensed: Education Digest 10:23-25. Summarizes recent studies on natural and artificial lighting.

Nation's Schools Portfolio. **Experiments in Artificial Lighting.** Nation's Schools; 41:4, 33-42. April, 1948.
Includes a good definition of terms, an analysis of costs, and the conclusion that the ideal fixture has not yet been built.

Nation's Schools Portfolio. **Lighting, Color, Furnishings.** Nation's Schools, 39:5; 33-48. May, 1947.
Color for safety and psychology, artificial lighting by an authority, and a report on the "Harmon Technique."

Sharp, Howard M. **A Critical Analysis of American Standard Practice for School Lighting.** American School Board Journal, 118:1; 33-4. January, 1949.
To be read with the Standard Practice—points out internal contradictions and weaknesses.

Structural Materials and Design

Caudill, William W. **Structural Design and Materials.** The School Executive, 68:5; 52-3. January, 1949.
The trends towards repetitive structural units, movable partitions, fewer and larger components, and speedier erection techniques.

Linn, Henry H. **Floors for Educational Buildings.** The American School and University, 19:106-11. 1947-48.
The characteristics of various types of floors, and spaces where each is appropriate.

Smith, Eberle M. **Interior Walls in School Buildings.** The American School and University, 19:86-92, 1947-48.
A list of the factors in influencing choice of materials and two helpful tables of general characteristics and suitability.

GROUNDS

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EPILOGUE: The Meeting Comes to Order—Again

The Old One, the patriarch, is presiding again.

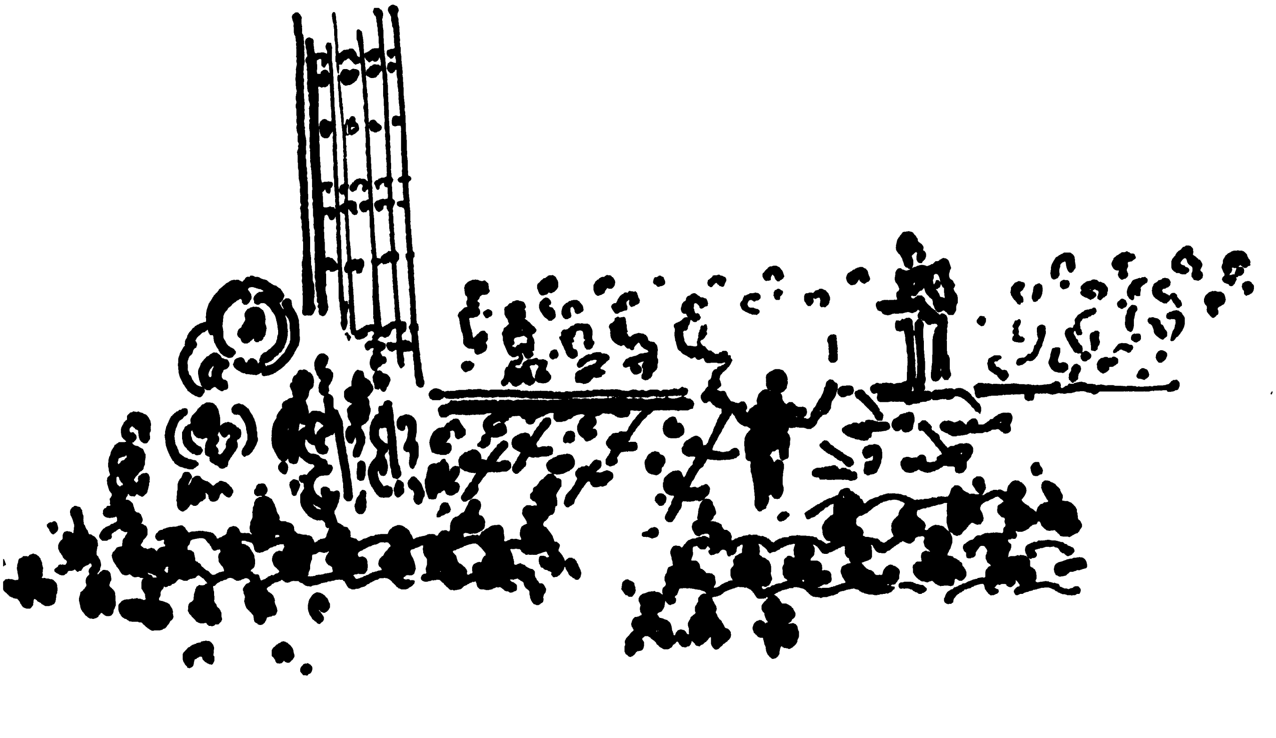
This time it is not a small meeting of a selected group.

This time it is a mass meeting, held to dedicate the new school. The folks who attended that preliminary meeting two years before—Mrs. Owen, the clubwoman; Jim Halloran, the chairman of the school board; B. F. Hawkins, the banker; Sam Jones, the contractor's brother; Mr. Kilroy, the young veteran; Mr. Vocek, the labor leader; Glen Collins, the architect; and Robert Shaw, the school superintendent;—are all present.

There are others too, now. This building has tapped the interest and talent of lots of others: Some professionally, like the contractor and the educational consultant; others in an advisory capacity, like the men from the State Department of Education, the United States Office of Education, and the local Planning Commission. But most got tangled in by their group interests—and found themselves held by the fascination of a growing community interest.

There isn't room for them all on the stage. But they're present, most of them. It's hard to see which is stage and which is auditorium. Pride and joy shine out at both levels. The separation is only physical and temporary. Teachers and students, custodians, nurse, secretary, principal, superintendent, members of the board know it's their school—but not theirs. Park, Police, Fire, Health, Highway Commission have had a hand in it. The Chamber of Commerce, Rotary, Women's Club—all service, all veteran, all civic organizations are represented. It's theirs, too.

The school orchestra marches through the Overture from William Tell. The Old One ponders these things. His eyes rove out over the crowded hall; far-seeing, shrewd old eyes.



The orchestra finishes in a flourish of triumphant teamwork. But the Old One is glued to his seat by a sudden notion. None of those organizations is here. These people out here aren't organizations. They're just people—neighbors, friends come together. They're here to rejoice at a birth; truly to dedicate not just a school, but a community—themselves!

Neighborly whispering slowly subsides. The foot-shuffling and the throat-clearing diminish. The Old One rises. A man with a clerical collar rises with him. No introduction is made nor needed. Just a wave of the Old One's arm and the people stand. The man says an earnest few words asking blessing on the people, the community, and this meeting; and on this school they have built.

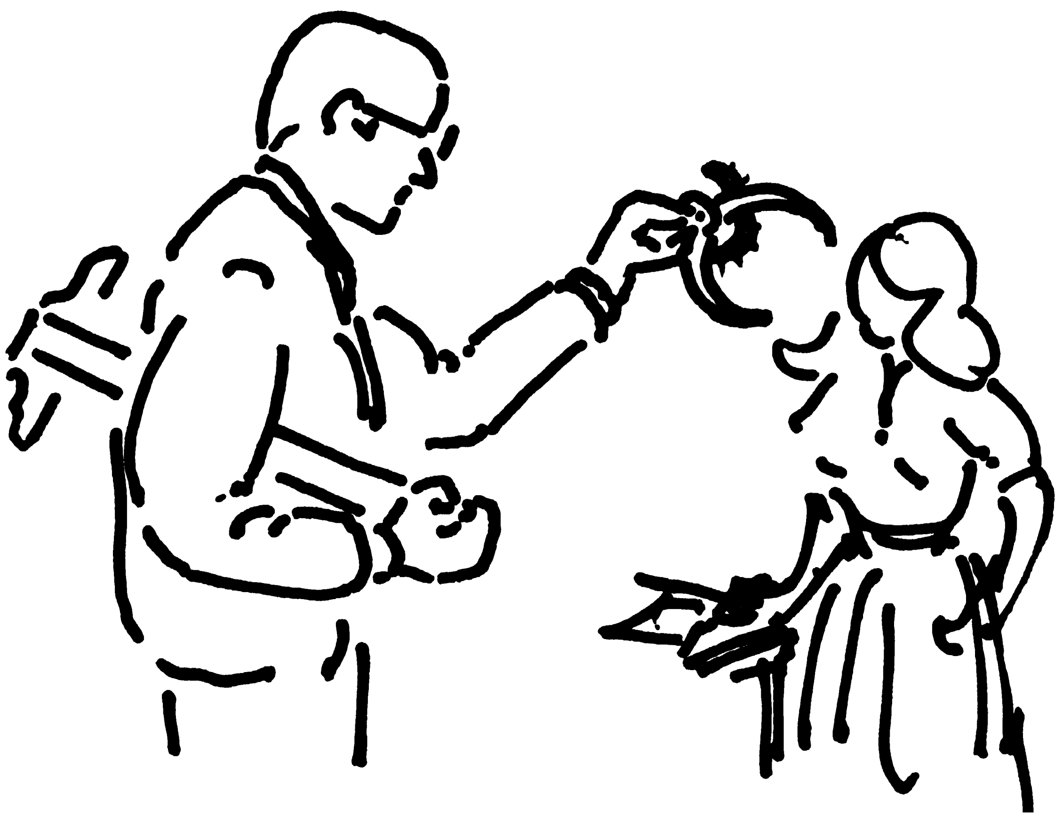
The Old One walks to the speaker's stand as the assembly settles down again. His eyes sparkle now. Who will blame him if he is a little exhilarated by his heady notion? He lifts and drops the gavel. The familiar sound brings him all the way back to familiar ground.

The Old One: Ladies and gentlemen, friends, you all know what we're gathered for tonight. We're dedicating this new school. Now when I was a lot younger, an occasion like this would call for importing a speaker—the governor, maybe, or a senator, or someone from the state university—and listening to a lot of oratory. But not tonight. If it's all right with you folks! (Chuckles and a muffled cheer or two) Frankly, we won't have time. We're going to do this dedication sort of different, and I want Jim Halloran—you all know he's chairman of the school board—to tell you about it.

Mr. Halloran: Thank you, Mr. Chairman. Ladies and gentlemen. We started planning this school two years ago, as you all know. And we decided right from the start it was too big and important a job for us. We needed your help, and praise be, we got it. If this doesn't sound too much like oratory, what we wanted was a school of the community, by the community, and for the community. And this is it. It took a lot of work. Sometimes while we were planning—and working—there were some differences of opinion. But they got ironed out, and all for the best. What we aim to do here tonight is to let all of you know how big this job has been, and who some of the people are who pitched in and helped, and what they did. I've got a long list of folks here—people who deserve special credit for the way they helped you folks—helped all of us—get the school this community needs. Right at the top of the list is Robert Shaw, our superintendent. He headed up the whole thing, and got it organized, and worked night and day to see that it was right. We'll hear from him later. Now I want you folks to meet Glen Collins, the architect, whose firm worked with our planning committee and experted the planning. Stand up, Glen. I always thought an architect was a sort of arty dude who put the frills on the outside after the building was built. I guess I was wrong. Glen actually went to school. That's right — he actually attended classes, so he'd get acquainted with our teaching methods. He interviewed teachers—and youngsters, too—to get reactions to ideas that were cooking in his mind. He and the members of his firm turned out to be real hard-boiled analysts, and while I hate to bring up such a sordid subject, I believe they actually saved us some money. Next comes a man you all know, at least by reputation—our friend in the bank, B. F. Hawkins. He handled the details of financing, and he marketed the bonds we voted, on

mighty fine terms. But he did more than that. His judgment was always worth asking for. And just as an example of the way he went about getting things done —when we started planning this school there was a provision in the code that required ceilings twelve feet high—well, thanks to B. F. and some good folks in the State Department of Education, that part of the code is changed and we've got sensible ceilings, nine feet high—a lot better looking, a lot cheaper to build, and they'll cost a lot less to heat.

And as Jim Halloran read off the list the Old One listened and was pleased. Doggoned if he'd ever seen such an all-out community enterprise before. Halloran was mentioning Joe Vocek and the way he had got organized labor to support the school. Too bad he couldn't come right out in public and tell how much that meant in terms of costs to have Vocek working for the school one hundred



per cent. Halloran went on. Now he was mentioning Mrs. Owen, who had fought for something fancy and old-fashioned. Amazing how you could never figure out a woman. Soon as she knew she was licked she waded in and fought for the new plan instead of against it, swung her weight around as far as the state capital, probably helped more than any other individual in putting over the consolidation that combined three adjoining school districts, got rid of obsolete one-room schools, and made possible the kind of plant the community needed. Might be a good idea to put a picture of Thomas Jefferson in the honor spot in the library, just for Mrs. Owen. He was telling about the veterans—some of them Seabees — who hadn't learned what couldn't be done. They'd helped find ways to build classrooms that'd serve young 'uns by day, grown-ups at night. Yankee ingenuity! The Old One chuckled. Come to think of it not Yankees—just Americans.

On droned Halloran, reciting the list . . . the activities teacher who helped plan the museum and shop . . . the P.T.A. for supervising the school census, and the Cub Scouts for doing the leg work . . . the art teacher whose suggestion turned the corridors into art galleries . . . the librarian, who had organized a reading list of material on school architecture for anyone who would be interested . . . the janitor, who had come up with some mighty sound ideas for saving time and money on maintenance . . . the head of the county medical society, for getting cooperation of the community's doctors in helping to plan the school's health program and the rooms it would need . . . the head of the local bus company for traffic surveys and estimates, and for the warning that the original plan for the bus garage wouldn't be big enough to accommodate new buses five years from now . . . the physics teacher for preparing studies on color and working with the local painting contractor in developing color schemes . . . the safety director at the mill, for helping make the new building as hazard-proof as possible . . . why, doggone it, the Old One thinks, he'll just about have to call the roll of the whole community, and what would be wrong with that?

Finally, Jim Halloran came to the end of his list. It was the Old One's turn again to wield the gavel. He did, and called the superintendent, Robert Shaw, to make the closing remarks . . .

Mr. Shaw: Mr. Chairman, ladies and gentlemen. There aren't many remarks to be made. This school speaks for itself. And it will continue to speak for itself in the years to come. I'd like to remind all of you that as we dedicate this new plant it is already starting to become obsolete. It is up to all of us to keep it alive, keep it growing, keep it changing to meet the changing times. Together we planned it so it could change. We merely ask that we continue together, that you keep up your interest in this, our community project. We see here tonight what can happen when a community works together in complete cooperation. We saw many evidences of the force of community cooperation during the war. But this, this is different. This job of community effort was started and completed while this community was at peace. Maybe that's a good sign. Maybe community efforts like this, devoted to these constructive purposes, will some day make obsolete those other group efforts performed under the pressures of war. It is a hope, and it's worth cherishing.

The Old One: Amen! (He turns to the orchestra and nods.)

The first chords of the Star Spangled Banner sound out. All stand. All stand erect—in pride and humility—even in reverence. All stand together.

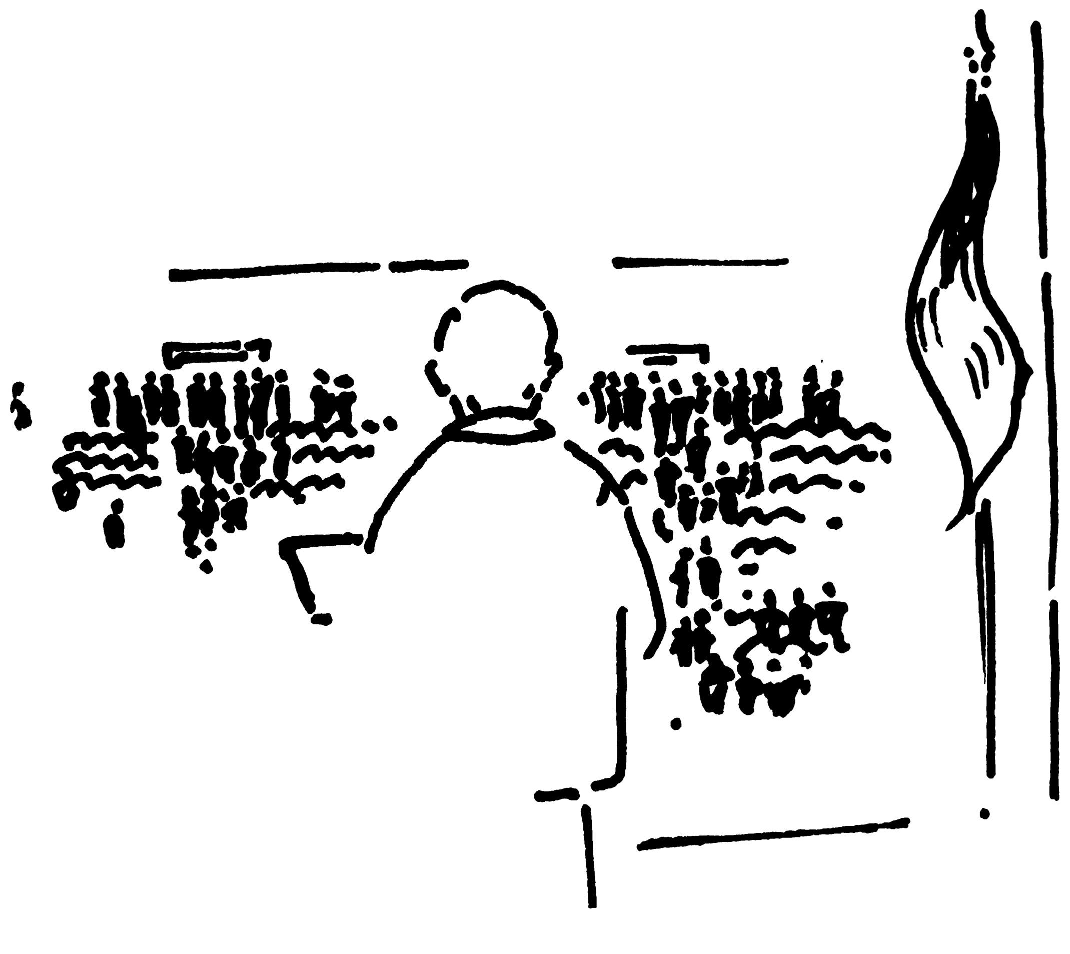
At this moment the school is truly dedicated—and the people, the community.

The music ends. Spines stop tingling, and after a momentary hush, friend turns to friend, neighbor to neighbor. The spell dwindles. The assembly breaks up. Groups depart—families—individuals—a little reluctantly, they leave.

Yes, and they leave behind a part of themselves, of their dreams and their sweat.

They leave . . .

But they'll return.



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